APRIL 1957—SIXTY-THIRD YEAR

MACHINERY



TO MEET THE REQUIREMENTS of more and more machine tools operating efficiently and economically at high speeds to exacting limits, Fafnir is producing Super-Precision bearings to extremely close tolerances in record numbers. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR





Here's how

VERTICAL Bore-Matics

can save time and money on many precision-finishing jobs

LESS FLOOR SPACE These compact Vertical Bore-Matics save precious floor space, make use of more available up and down areas, permit operator to handle more than one machine.

EASIER LOADING Parts located down and onto the fixture, not up and into the workholding device. All stations are front stations - less reach and stretch.

IMPROVED CHIP AND COOLANT CONTROL Vertical units lend themselves naturally to gravity control of chips and coolant by means of simple, effective

CONTINUOUS PRODUCTION Independent operation of each station provides maximum opportunity to keep stations cycling continuously except for loading and unloading time.

> THESE are just a few of the reasons why many types of work can be handled more efficiently and economically on a Heald Vertical Bore-Matic than on any other type of precision-finishing machine. For further details, send for Bulletin 2-352-1, Issue 1.

Ten Model 352 VERTICAL BORE-MATICS precision finish 5 different automatic transmission parts

Shown above is an installation of Heald Vertical Bore-Matics in a large automotive manufacturing plant. These spacesaving machines are used for high-production Borizing of the following automatic transmis-sion parts:

- Disc and Hub Assemblies First Turbine Convertors
- Convertor Pump Housings
- Turbine and Shaft Assemblies
- Second Turbine Convertors Versatility of cycling and ease

of tool changing makes these units readily adaptable to future job changeovers.

IT PAVS TO COME TO HEALD



MACHINE COMPANY

Chicago

Subsidiary of The Cincinnati Milling Machine Co. eveland • Dayton • Detroit

Indianapolis

Worcester 6. New York

MACHINERY

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Machinery

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APRIL 1957

NUMBER 8

The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

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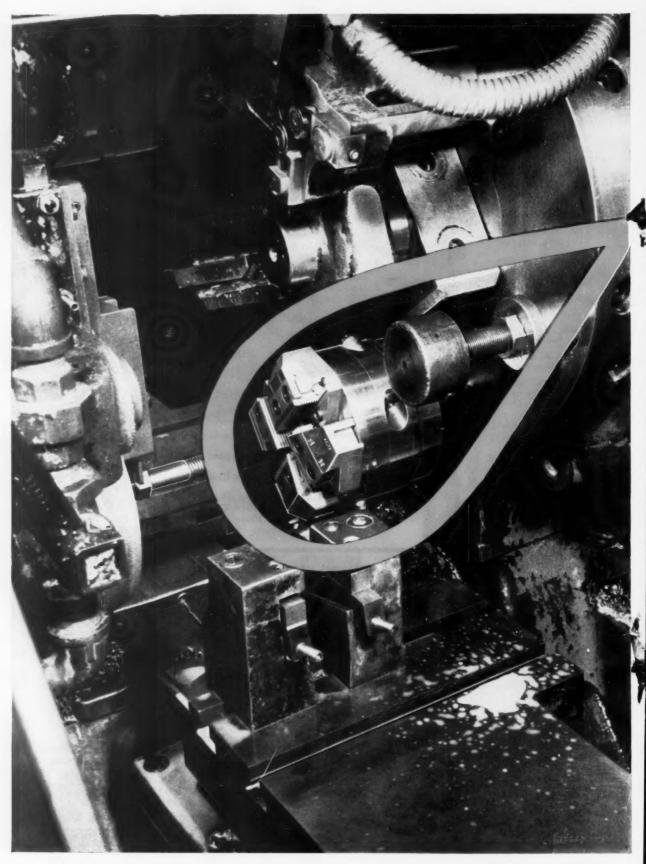
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2-Machinery, April, 1957

AUTOMATIC THREADING

to close tolerances on single-spindle automatic

Automatic opening and closing and ability to meet exacting concentricity requirements were the principal reasons a LANDIS Die Head was selected to thread drive wheel cap screws for industrial lift trucks manufactured at the Yale Materials Handling Division of The Yale and Towne Mfg. Co. in Philadelphia, Pa.

5%", 11-pitch UNC threads are cut 7%" long on 3140 steel by a LANDMATIC Head on a Cleveland Single-Spindle Screw Machine. Threads must meet Class 3 tolerances—in addition, the threads must be concentric with the screw body within .002".

A 1-1/4" FD LANDMATIC Head is being used for this work—a stationary, self-opening head arranged for automatic closing. A special over-travel feature eliminates the necessity of a complicated, accurately-set closing cam on the machine. Threads are produced to necessary tolerances at 18 SFM, with 400 pieces completed between chaser grinds.

This head, other than the over-travel feature, is a standard LANDMATIC Heat-Treated Head (primarily used for turret lathe threading) equipped with standard LANDIS Tangential Chasers. Even with this tough material, close tolerances are met with an excellent number of pieces between grinds. Further economies are realized as the chasers with regrinding will produce these threads for 80% of their original length. Wide range and oversize capacity are important features of the head—1/4" to 1-1/4" normal range, short thread lengths up to 2-3/4" in diameter with oversize chaser holders.

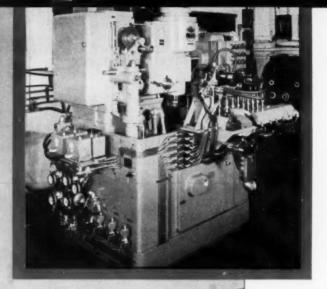
A wide variety of sizes and types of LANDIS Heads allow you to gain the utmost "threading efficiency". Send us your specifications and ask for Bulletins F-80 and F-90—let us suggest the LANDIS Head most suitable for your needs.

LANDIS Machine Company

4784



MANUAL or AUTOMATIC



Practically any shaped part in its size range can be cut faster and more accurately on a Fellows No. 4GS Gear Shaper... with either manual, semi-automatic or full-automatic operation, depending on your needs!

This production flexibility makes the powerful "4GS" ideal for long runs on similar parts or for short runs of varied jobs. Set-ups are easy and fast. Internal or external spur and helical gears, as well as splines, cams and other irregular non-involute shapes up to 6" P.D. and 2" face width can be cut on this machine.

Nine cutter speeds range from 98 to 635 strokes per minute.

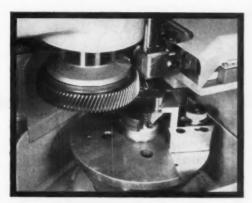
The versatility of Fellows No. 4GS Gear Shaper, with manual operation or any degree of automation, can very probably lower *your* cutting costs. Ask your Fellows Representative to show you facts and figures. Write, wire or phone any Fellows office.

THE FELLOWS GEAR SHAPER COMPANY 78 River Street, Springfield, Vermont Branch Offices:

1048 North Woodward Ave., Royal Oak, Mich. 150 West Pleasant Ave., Maywood, N.J. 5835 West North Avenue, Chicago 39 6214 West Manchester Ave., Los Angeles 45 THE PRECISION LINE

FELLOWS "4GS"

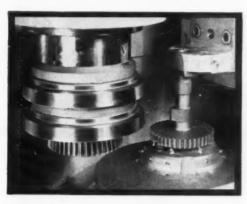
... or anything in between!



Helical gear cut on a motor crankshaft. Operation can be manual or semi-automatic. Part is held in a bushing at the bottom, an air operated split sleeve support at the top and driven from the connecting rod bearing surface.



Internal clutch parts produced with fully automatic loading and unloading. Part is transferred from loading chute to air operated expanding arbor and teeth are cut. Part is then removed from arbor and transferred to unloading chute while another blank is being loaded.



Two cams and a gear are cut at the same time on this gasoline motor part. Cutters are used in tandem and are keyed together to give the required relation between the positions of the cams and the teeth of the concentric gear. Operation is manual.



Automotive transmission cluster gear shaft handled automatically. Air operated "fingers" move shaft into position for automatic chucking and then place finished part in unloading conveyor.

FELLOWS Gear Production Equipment

CINCINNATI Cutter and Tool

give you a strong secondary line



Whatever is good for the cutting edge of your expendable tools is good for production. And CINCINNATI® Cutter and Tool Grinders are certainly good for the cutting edges of all types of milling and die sinking cutters, reamers, hobs, taps and others. There are 5 machines in the Cincinnati group. They constitute an exceptionally strong secondary line of production equipment for machine tools of all types. Sweet's Machine Tool File contains brief specifications, and complete data may be obtained by writing for catalogs.

THE CINCINNATI MILLING MACHINE CO. CINCINNATI 9, OHIO

No. 2 FILMATIC—For grinding the majority of cutters used in metalworking shops of all sizes ... milling cutters, reamers, hobs, taps, planer tools. Host of attachments available, including Radius Grinding; Face Mill; Indexing for Workhead; Dust Exhaust; Spring Chucks and Collets. Capacity: 10" swing over table, 27" between centers. Catalog No. M-1914-2.

No 1.—A companion machine for the No. 2, or in shops using only small- to medium-sized cutters, the No. 1 will be your first choice. Timesaving features include anti-friction table slide; eccentric wheelhead swivel mounting; reversible motor built into wheelhead; three-way controls. Capacity: 8" swing over table, 15" between centers. Catalog No. M-1852-1.



Grinders of production



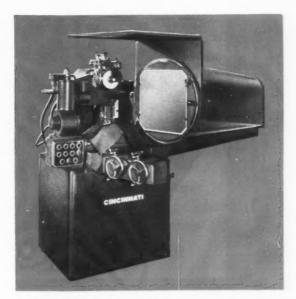


CONTOUR—This machine offers a big saving for shops having a volume of form milling operations. It grinds form milling cutters on the periphery of the teeth to a definite cutting clearance chosen for the work material. Contour ground cutters produce a greatly superior finish at a higher feed rate. Catalog No. M-1918-1.

MONOSET—For sharpening, repairing and making small cutters including countersinks, those required for die sinking, and other unusual shapes. Because of the universal construction, most jobs can be completed in one chucking. Built-in spiral lead mechanism generates infinitely variable helices, right- or left-hand, 1^{+3}_{13} " min. lead. Catalog No. M-1591-3.



CINCINNATI

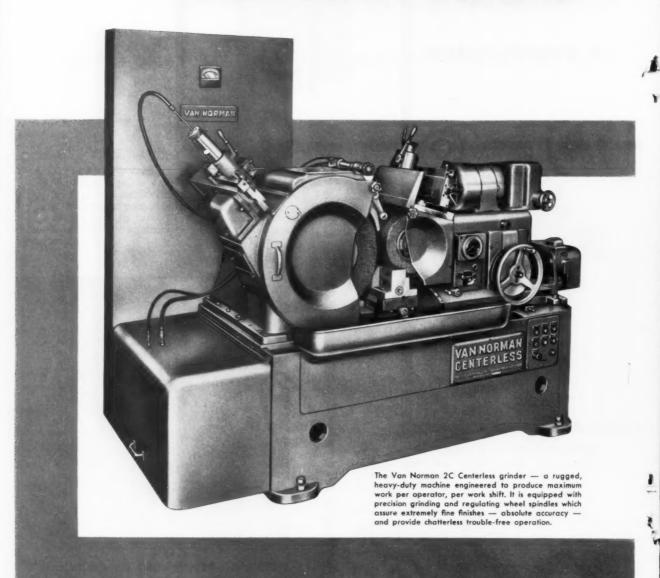


PROJECTO-FORM—For grinding small, accurate profile shapes on flat form cutters, lamination die parts and similar components. This machine combines grinding with an optical comparator unit. Work profile is enlarged 20 X on ground glass viewing screen directly in front of operator. Master drawings made on Layout Scribing Machine. Catalog No. M-1612-5.

MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • METAL FORMING MACHINES HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID • GRINDING WHEELS

VAN NORMAN

Centerless



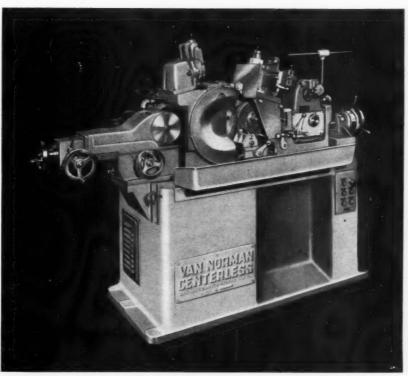
VAN NORMAN MACHINE

a division of Van Norman Industries, Inc.

MANUFACTURERS of—Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

Grinders

Precision Grind Parts Fast, Economically, To Close Tolerances



The Van Norman 1C Centerless grinder — finish grinds some small parts from solid . . . or finish grinds rough-turned parts. The 1C is especially suited for grinding parts used in business and office machines, sewing machines, electrical appliances, aircraft, automobiles, munitions and similar work.

COMPANY

Don't wait . . . for extra profit install a Van Norman machine now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate up to 10 years.

Van Norman Centerless grinders are precision-manufactured to produce a wide variety of parts made of metal, wood, fibre, plastic or glass. Actually these Van Norman Centerless grinders are three machines in one . . . will handle thru-feed work, in-feed work and - equipped with a Crush Dressing Attachment - form grinding and profile work. Get complete details on the Van Norman 1C and 2C Centerless grinders. Write. wire or telephone for catalog.

One Machine for all these grinding jobs

Landis Universal and Tool Grinder



precision grinders

Landis 12" x 28" Universal and Tool Grinder -two machines in one-a tool grinder and a universal grinder. Catalog K - 53

LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

cylindrical and taper





Also sharpens these tools:

Taps

Formed cutters

Spiral mills

Milling cutters

Hobs

Forming tools

Gear cutters

Face mills

End mills

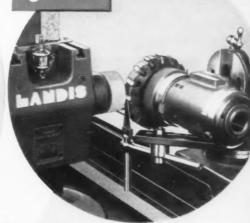
Drills

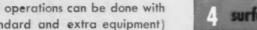
Saws

Reamers

(All operations can be done with standard and extra equipment)

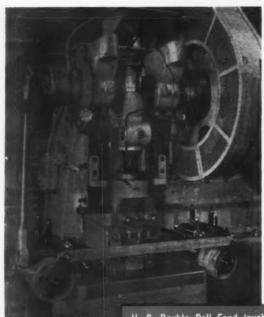






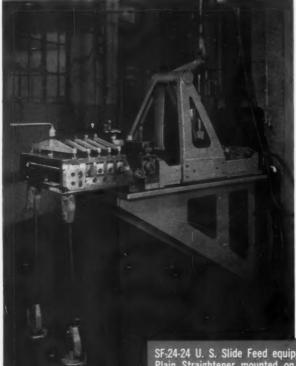




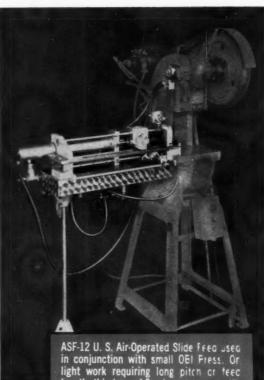


IMPROVE PRESS-ROOM

U. S. Double Roll Feed (push-pull type) mounted on conventional OBI Press. Direction of feed can be either right to left or left to right. Made in range of sizes.



SF-24-24 U. S. Slide Feed equipped with Plain Straightener mounted on Straight Side Press. Capacity for material up to 24" in width, feed length adjustable up to 24" per stroke. Same type of Feed made in smaller sizés.



ASF-12 U. S. Air-Operated Slide Feed used in conjunction with small OBI Fress. Or light work requiring long pitch or feed length, this type of Feed can be used with presses much smaller than would ordinarily be required.

PRODUCTION WITH THESE



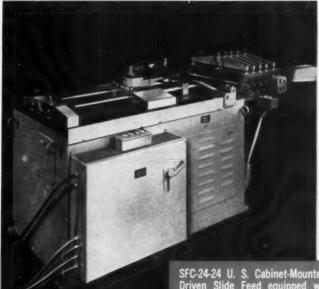
Gain all the advantages from the use of coil stock in your Press Room by arranging your presses with automatic equipment. The illustrations show just a few of the many units included in the line of U. S. Automatic Press Room Equipment designed and built to aid you to reduce costs and increase production. Every operation eliminated will increase your profit potential and place you in a more favorable position in today's competitive market.

Investigate! Ask for copies of Bulletins 80-M and 95-M.

U. S. TOOL COMPANY, INC.

Ampere (East Orange)

New Jersey



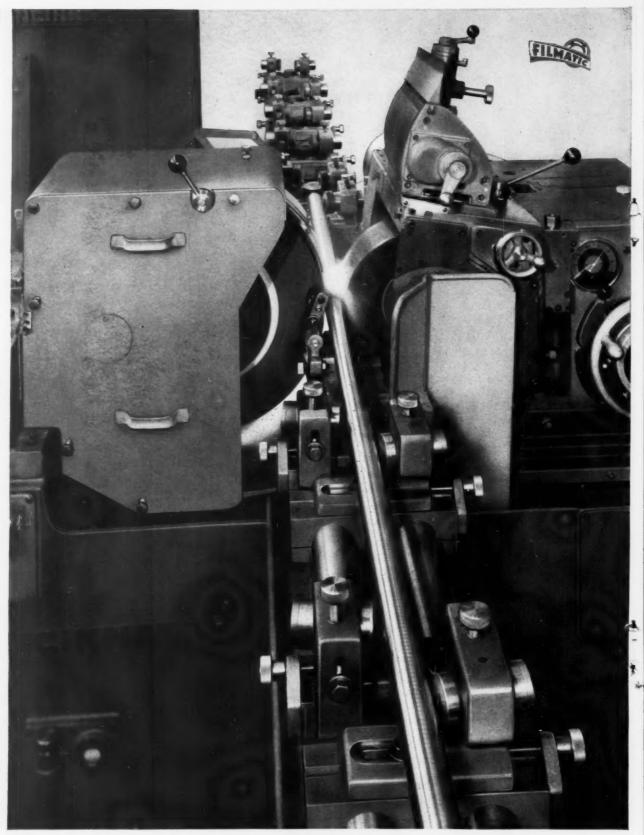
W. S. PRODUCTS

Slide Feeds
Roll Feeds
Stock Straighteners
Stock Reels
Stock Oilers
Coil Cradles
Wire Straighteners
Die Sets
Multi-Slides ®
Multi-Millers ®

SFC-24-24 U. S. Cabinet-Mounted Motor-Driven Slide Feed equipped with Plain Straightener. Capacity for material up to 24" in width, feed length adjustable up to 24" at one stroke. Equipped with counter to permit multiple stroking to obtain longer lengths.

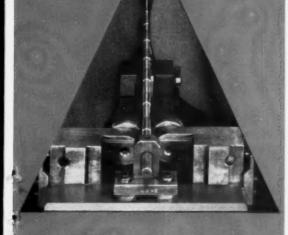






CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE 16—Machinery, April, 1957

Cincinnati



Filmatic No. 3's ... Make Your Tough **Centerless Grinding Jobs Look Easy and Cost Less**

Thrufeed grinding 4" steel bars, or infeed grinding multiple diameter spindles up to 20" long are tough jobs for any centerless. CINCINNATI® FILMATIC No. 3's make these jobs, and thousands of in-between sizes and shapes, look easy and cost less. The No. 3's are extra powerful to give you extra productive capacity combined with Cincinnati's well-known dependability of performance. Contributing factors to these desirable elements of low production costs include:

- 1) Fixed bedrock mounting of the grinding wheel spindle for fast, economical grinding
- 2) FILMATIC grinding wheel spindle bearings for highest quality performance and zero maintenance. They're self-adjusting for every job
- 3) Pre-loaded, precision anti-friction regulating wheel slide, for super-precise size control
- 4) Infinitely variable regulating wheel speeds ranging from 10 to 320 rpm, for quick selection of the correct speed
- 5) Automatic grinding wheel balancing (supplied at extra cost)

Eleven additional features and their relation to the proved dependability and productive capacity of CINCINNATI FILMATIC No. 3 Centerless Grinders are outlined in catalog No. G-664-1. Ask for a copy today. You will find brief data in Sweet's Machine Tool File.

CINCINNATI GRINDERS INCORPORATED CINCINNATI 9, OHIO

CINCINNATI



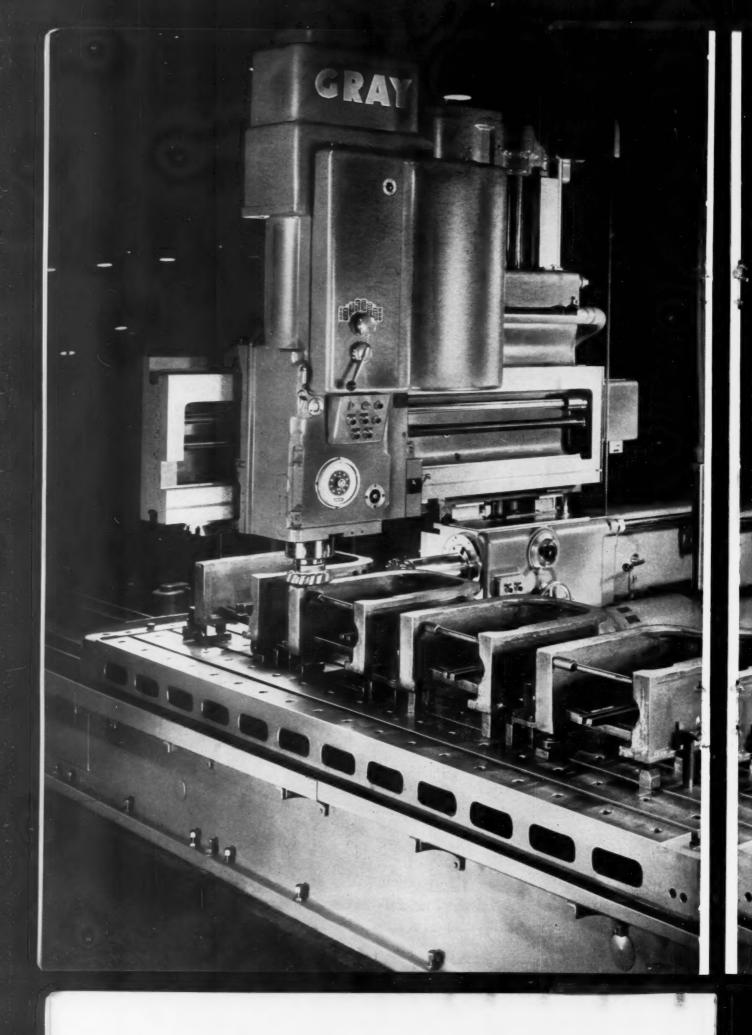
CINCINNATI FILMATIC No. 3 Centerless Grinding Machine Catalog No. G-664-1

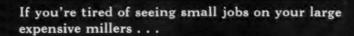


GRINDING MACHINES . CHUCKING GRINDERS . MICRO-CENTRIC GRINDING MACHINES . CENTERLESS LAPPING MACHINES

For more information fill in page number on Inquiry Card, on page 255

MACHINERY, April, 1957-17





If you're tired of extra set-ups because your miller has only a single head . . .

If you're tired of whittling away at rugged jobs with low power heads . . .

If you're tired of complicated controls that make your operator a mountain goat . . .

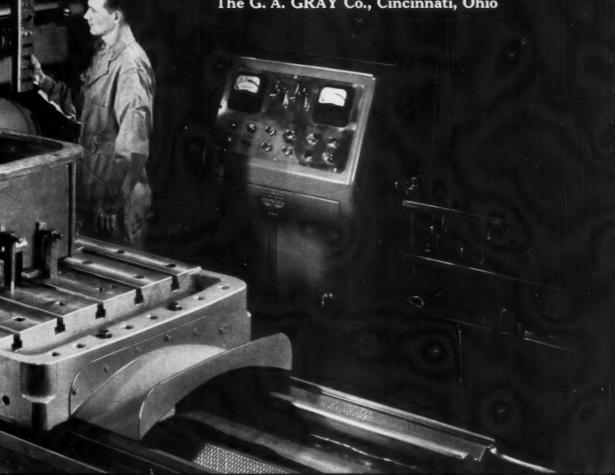
this new

GRAY HANDYMILL

is for you

Built in a wide range of high horsepower sizes, with great variety in head combinations, simplified pendant control, it fills a long standing need for a powerful, rigid, milling machine for medium sized jobs.

The G. A. GRAY Co., Cincinnati, Ohio



BURGMASTER® TURRET DRILLS

save space, increase production, hold close tolerances at

THE GARRETT CORPORATION'S

AiResearch Manufacturing Division

Here's what the company has to say:

"Use of the Burgmaster Model 1C turret drill has been a valuable item in space conservation.

Four Burgmaster drills, each carrying six spindles, take up about 15 feet of space at AiResearch, while next to them a line of 20 single-spindle machines occupies three times the space.

The Burgmaster contributes to increased production and more proficient operation by operators, since it permits them to perform in one place a job requiring various types of spindles, which would otherwise necessitate moving back and forth on a line of conventional spindles. It allows use of a stationary jig for operations of various depths and sizes.

Tolerances within .0005 and less can be consistently maintained by the Burgmaster 1C on ream and bore diameters, with .0003 to .0005 on hole locations in jig work."

The Burgmaster 1C 6-spindle turret drill is a sensitive feed, fast operating machine. It features such important benefits as power indexing, preselective speeds and stops, time savings and increased accuracy by elimination of quick change tools. It easily handles holes up to %" in steel. Larger capacity Burgmasters, both manual and automatic hydraulic are available.



The part in the particular operation shown is a carriage used in a pressure-ratio transducer. Tolerance specifications require that all bores be within .0005 of centerline of each other.

For complete information, write Dept. M-4.

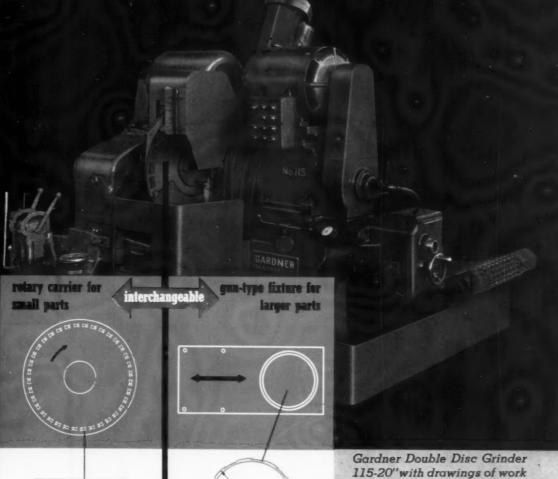


BURG TOOL

Manufacturing Company, Inc. 15001 S. Figueroa St., Gardena, Calif.

RIDGEWOOD, N. J. • CHICAGO • CLEVELAND DETROIT • SAN LEANDRO, CALIF.

Gardner dual fixturing adds versatility





Production:

2100 parts per hour Stock Removal:

.020" over-all, rough cut .010" over-all, finish cut

Tolerances

Flatness: .0003" Parallelism: .0003" Uniformity: .001" 11 RMS Finish:



Production:

1 part every 40 seconds Stock Removal:

.011" to .016"

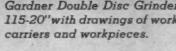
Tolerances

Flatness: .001"

Parallelism:

.0003" to .0004"

.0008" Uniformity: 11 RMS Finish:

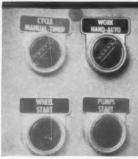


grinds rwo parallel surfaces ONE operation

741311111313

precision disc grinders BELOIT, WISCONSIN

Profits in easy reach...



Flip this switch to set work rotation and coolant flow for manual operation or automatic operation with the cycle.



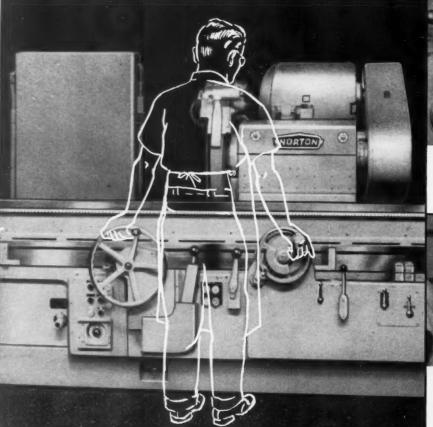
Use this lever to jog work rotation for roundness inspection or unloading.



Turn these knobs to set separate dwell controls for each end of table travel.



Use this lever to select preset table-truing or grinding speed — eliminating need for continual re-settings.



All controls for feeds and speeds within easy reach.



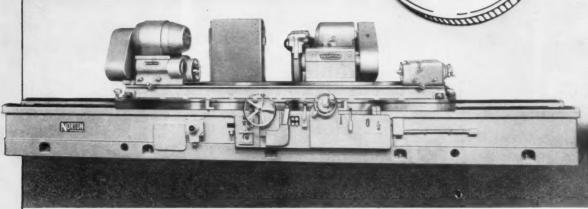
Count the indexing clicks on this wheel-feed handwheel for work diameter reduction in increments as fine as .0001".



Use this simple control for adjusting automatic feed from zero to .003". Total automatic feed is .150" on diameter, with automatic reset after grinding to size.

with two new <u>advanced</u> design Norton Cylindrical Grinders





The Norton 14" x 96" Type C-2 Semiautomatic Cylindrical Grinder — one of two sizes of new cylindrical grinders just announced by Norton.

The other is the $18^{\prime\prime}$ Type LC-2. Work length capacities of $36^{\prime\prime}$, $48^{\prime\prime}$, $72^{\prime\prime}$, $96^{\prime\prime}$, $120^{\prime\prime}$, $144^{\prime\prime}$ and $168^{\prime\prime}$ are available.

Feed and Speed Adjustments all on front of 14" Type C-2 and 18" Type LC-2 Grinders... Key Maintenance Points Easily Accessible

Features on these two new Norton cylindrical grinders mean more profit because they eliminate waste motion.

Operators of the 14" Type C-2 and 18" Type LC-2 need never leave their normal positions to make changes in settings. Controls are all at their fingertips.

All equipment needing occasional inspection is in easy reach. Electrical controls are grouped in an elevated enclosure. Motors, pumps, filters, pressure relief valves, and ways lubricant valves are all mounted on the outside for inspection or service.

The machines incorporate the proved Norton wheel spindle design, positively controlled micrometer-fine wheel feed design and generous, rugged overall construction to insure highest productive capacity and unsurpassed sizing control. They assure lowest costs in producing highest quality parts.

These features and many more give you the "Touch of Gold", by making your grinding more profitable. And only Norton can bring you the long experience with both grinding machines and wheels that is engineered into these advanced machines.

Ask Your Norton Representative

for more facts about the new 14" Type C-2 and the 18" Type LC-2 cylindrical grinders. Or write direct to NORTON COMPANY, Machine Division, Worcester 6, Mass. In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.

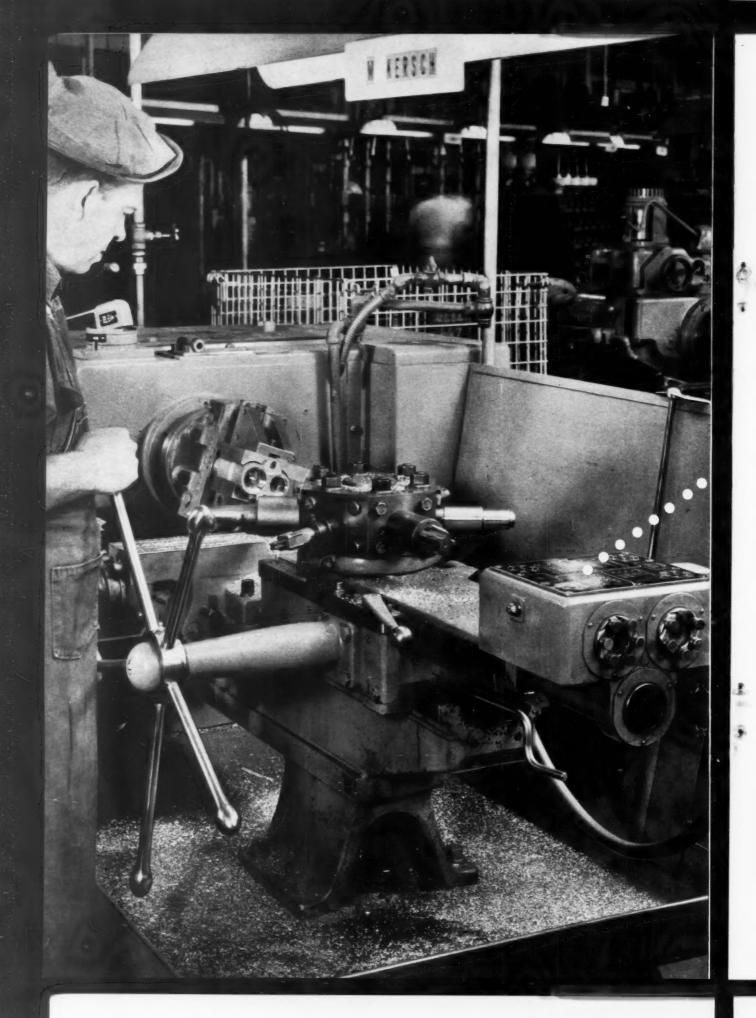
To Economize, Modernize with NEW



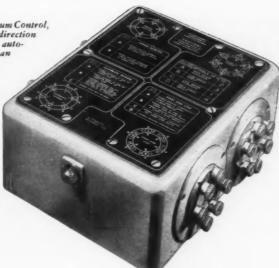
Making better products . . . to make your products better

Norton Products: Abrasives • Grinding Wheels • Grinding Machines • Refractories
Behr-Manning Products: Coated Abrasives • Sharpening Stones • Behr-cat Tapes
District Offices:

Worcester · Hartford · Cleveland · Chicago · Detroit



By simply presetting this Electro-Cycle Drum Control, spindle speed, starts and stops, spindle direction and reverses for each turret face are automatically controlled. Your operator can quickly handle large volumes of precision work, without tiring himself on time-consuming manual operations.



• Warner & Swasey Electro-Cycle® Turret Lathe boosts production 30% at Decatur Pump Co.



WARNER & SWASEY Cleveland PRECISION MACHINERY SINCE 1880

Automatic lathe operation, provided by the Electro-Cycle principle, substantially reduced both handling time and operator fatigue. Immediately, production increased and profits improved.

This nationally-known producer of "Burks" Super Turbine and Centrifugal pumps, located in Decatur, Illinois, recently replaced a conventional geared head turret lathe with a new Warner & Swasey No. 3 Electro-Cycle. Immediately, their production of pump jet bodies—machined from bronze castings—increased 30%.

Using his new Electro-Cycle, the operator easily produced more finished parts per shift because:

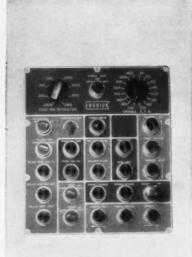
- Workpiece handling was cut to a minimum.
- Fatigue was substantially reduced.
- Automatic operation eliminated all time-consuming hand work.

On both ferrous and non-ferrous materials, Electro-Cycles are daily turning in equally impressive records in machine shops all over the nation. Why not ask our Field Representative to show how they can help increase your production—and profits, too.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY



Dial dimension direct from print. There are two sets of direct-reading drum dials, one for longitudinal, the other for transverse position. Operator simply sets dials so that numbers on dials correspond with numbers on blueprint. Simple. Direct. Precise.



POSITION

Press two buttons, one for longitudinal, one for transverse positioning. Table, and work, are automatically positioned, and clamped under the tool, accurate to ± .0001"! Accuracy is dependent upon highest-quality gages, not upon screw threads. Sensitive .0001 Dial Indicators maintain a positive check at all times.



Tool changing takes less than 10 seconds, with BF spindle. Can be accomplished while table is positioning. Hole sizes are repeated within ± .0001", without resetting tools! High-precision tool holder

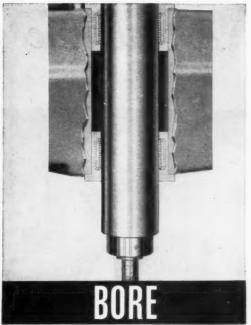
is built right into the spindle of the Jig Borer. Adapters accommodate both

standard and special-sized tools.

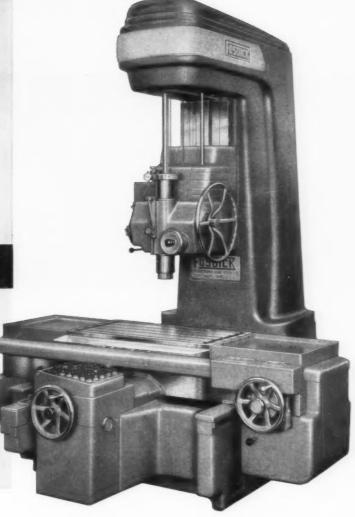
FOSMATIC JIG BORER

AUTOMATIC Positioning

DIRECT DIMENSION
MEASURING



Push-button precision boring. For finish boring, change tools quickly, then bore at touch of button. The hardened alloy steel quill rides on 800 preloaded balls mounted in precision bushings located permanently at top and bottom of head—as close as possible to spindle nose for maximum rigidity. Spindle is guaranteed not to exceed .0002" runout at the end of 12" proving bar!



MEASURE - POSITION - CHANGE TOOLS START BORING ... ALL IN SECONDS!

hole size and position accurate to ± .0001.

The new Fosdick Jig Borer can be used for the finest toolroom boring or for production of precision holes. Like the scores of Fosdick Jig Borers in plants throughout the United States, this machine will perform consistently to \pm .0001" . . . in measured table and saddle position as well as hole size.

The Fosmatic Jig Borer is extremely simple to operate. Changing of feeds and speeds, all movements of the table, saddle, and head can be accomplished by push button. Spindle is started and stopped by lever on head. Machine may be equipped with or without automatic positioning. Can be equipped for numerical control with either tape or card systems.

Other features available as extra equipment include Milling Feed, Rapid Traverse to Quill, coolant system and reversing motor for tapping.



A new line

Major breakthrough in grease technology results in development of new thickening agent. New grease has greater high temperature stability, superior multipurpose qualities, improved lubricating properties.

Check Chart Of RYKON Greases

	Gradensiste	-
RYKON Grease No. O	0	
RYKON Grease No. 1	1	
RYKON Grease No. 2	2	
RYKON Grease No. 3	3	
RYKON Grease No. 3 Heavy Duty Line	3	
	3	
Heavy Duty Line		



STANDARD OIL COMPANY (Indiana)

of Standard Oil greases

GREASE

Standard Oil instituted a grease research and development project several years ago. The result of this work is the line of RYKON Greases, which contain a new non-soap, organic thickener.

RYKON Greases surpass in stability and performance the best greases made up to this time. They bring to industry new opportunities for improved machine performance. They greatly reduce maintenance and grease handling problems.

RYKON Grease Properties

RYKON Greases are smooth, buttery-textured greases, made from the finest quality, solvent-extracted oil. Their thickening agent is a Standard Oil exclusive. RYKON Greases have these high-quality characteristics:

High temperature stability—Better heat stability than any other petroleum oil grease. ASTM dropping point of 480°F. Maintain consistency in service at high temperatures.

Mechanically stable — Maintain consistency even under severe mechanical working.

Chemically stable — Inhibit oxidation. Oil and thickening agent in combination possess extremely good chemical stability.

Oil separation — Minimum bleeding of oil in service and storage.

Wide temperature range —Lubricate at high and low temperatures. Extended range of application thus obtained makes RYKON Greases truly multi-purpose.

Water resistance - Do not lose consistency in presence of water. Resists water washout.

Anti-rusting — Exceptional natural rust preventive characteristics.

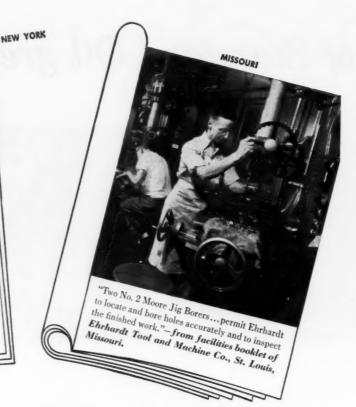
With RYKON Greases, lubrication can become simple, foolproof and less expensive—much less expensive, perhaps, than a single shut down caused by equipment failure due to the use of the wrong grease or the use of an "economy" grease.

RYKON Greases come in four Regular and three Heavy-Duty grades. Thus there is a RYKON Grease to take care of every grease lubrication job. Using RYKON Greases plant-wide can reduce your grease storage requirements, simplify lubrication maintenance training, cut down record keeping, save on dispensing equipment and reduce investment in grease inventories.

Get more facts about RYKON Greases. Call your nearby Standard Oil industrial lubrication specialist in any of the 15 Midwest or Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



"An irregular-shaped hole being ground to within .0002" on the No. 2 Moore Jig Grinder. The machine can do contour grinding of almost any size and shape."—from facilities booklet of August W. Holmberg & Co., Inc., Flushing, N. Y.



"FACILITIES, FACILITIES, FACILITIES..."

How Leading Tool and Die Shops Across the Nation Feature MOORE Jig Borers and Jig Grinders

Today, top contract tool and die shops often rely on illustrated booklets to sell prospects on their facilities. And they often rely on pictures of their Moore Jig Borers and Jig Grinders to indicate the degree of precision work they can do. It's particularly significant that leading contract shops choose Moore machines for "double duty"—in the toolroom and on the printed page—for these owner-managed firms are understandably deliberate and judicious in selecting machine tools. Write today for detailed bulletins on Moore's top-billed toolroom teammates.

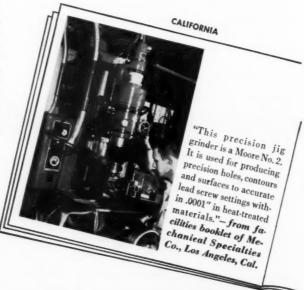
MOORE SPECIAL TOOL COMPANY, INC.

734 Union Avenue, Bridgeport 7, Connecticut



HOLES, CONTOURS AND SURFACES

Moore's all-new book tells you how to produce tools, dies and precision parts the modern way, 424 pages, 495 illustrations. \$5 in U.S.A., \$6 elsewhere.



ADD



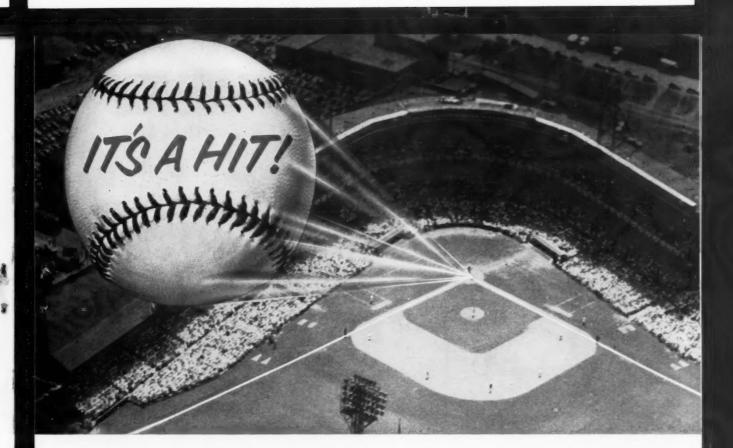
TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • PRECISION ROTARY TABLES

HOLE LOCATION ACCESSORIES

30-MACHINERY, April, 1957

For more information fill in page number on Inquiry Card, on page 255



How to IMPROVE your production BATTING AVERAGE

You'll lead the league when you switch to Cimcool, the radically new and different cutting fluid. Here are three ways that Cimcool Standard Concentrate can improve your production batting average:

- CIMCOOL LOWERS COST because it's longer lasting in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.
- CIMCOOL IMPROVES TOOL LIFE because of its chemical lubricity. It permits faster speeds and feeds, for it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned coolants.
- CIMCOOL IS CLEAN, doesn't soil clothing or hands. It contains no skin irritants. It leaves no slippery film on shoes, floors, machine or work. It can't smoke, can't burn, and virtually eliminates rancidity and foul odors.

For full details on CIMCOOL Standard Concentrate—and on the entire family of CIMCOOL Cutting Fluids—just contact us. Wire, write or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

CIMCOOL CUTTING FLUIDS

- CIMCOOL Concentrate—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.
- of highest tapping speeds and increases tap life amazingly.
- CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.
- cimcut Base Additive For jobs requiring oil-base cutting fluids. Added to mineral oils, it gives an economical mix for higher speeds and feeds.
- CIMCOOLBactericide The most effective agent yet developed to overcome rancidity and foul odors.
- cimcool Machine Cleaner The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

CIMCOOL Cutting Fluids

for 100% of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.



The impossible doesn't take as long

Impossible to convert an automated transfer-feed line? Not even difficult when it's a Clearing Transflex line. In fact, the whole automated setup can be converted from producing one part to another in about half an hour. The Clearing automated line above is equipped with a feed where the fingers on the feed bars can be adjusted, or faster still, replaced with a different set of bars pre-set for the

next job. The presses also have moving bolsters. Dies for the next run are set up outside the press while the presses are operating. When the run is completed, the new dies are powered into place at the touch of a button.

Think of it! An entire automated line ready to go on the next production run in about 30 minutes. That's not all. These presses are equipped

CLEARING PRESSES

CLEARING MACHINE CORPORATION Division of U. S. INDUSTRIES, Inc.



as you might think!

One modification of the Transflex line shown in the large illustration offers the benefits of automated production at a relatively moderate cost. This line has the same basic removable feed mechanism as shown above adapted to medium capacity machines. Feeds may be wheeled anywhere in the shop to automate other press lines.

with removable feed units. Consequently, part of the press line can be operated manually by simply rolling the feed units—they're on wheels—to one side. The last press in the line shown above is on manual operation. The first three are being readied for an automated, hands-off setup. Yes, the impossible is standard operating procedure with a Clearing Transflex line. Here then is automation so flexible that even a job stamping shop with requirements for many different parts can plan to automate some of its stamping production. There are many different Transflex ideas that Clearing engineers can discuss with you. Get in touch with us. There'll be no obligation.

THE WAY TO EFFICIENT MASS PRODUCTION

6499 W. 65th Street . Chicago 38, Illinois . Hamilton Plant, Hamilton, Ohio



VASCOLOY-RAMET PRESENTS...



NEW VR-75 quality carbide is a vacuum sintered steel-cutting grade developed specifically for use where high heat is generated. On such work, it will out-perform any grade of carbide available today

AVAILABLE NOW

In throw-away and long inserts for negative rake toolholders



VR-75 is an addition to the standard line of V-R quality steel-cutting carbides which meet 80% to 90% of all steel machining requirements. On applications where severe heat and shock conditions are a problem, new VR-75 is the thoroughly field-proven answer. It is ideally suited to heavy turning, facing, boring and milling jobs where coolants are not used . . . and will also give excellent results on a great many general steel machining operations.

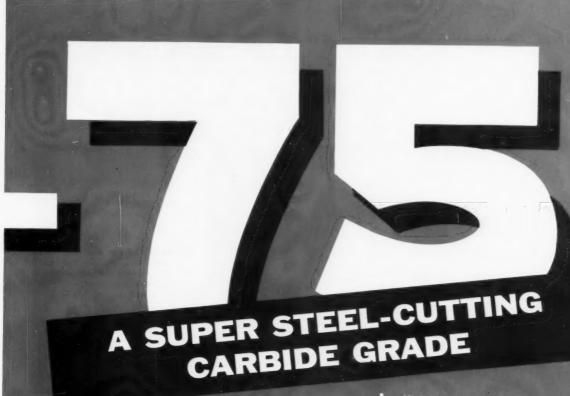
VR-75 gains its exceptional heat resistance, high edge strength and high shock resistance from the special blending of tungsten carbide, titanium carbide, tantalum carbide, columbium carbide and cobalt. Maximum performance is assured by its grain structure and exceptional purity. Vascoloy-Ramet's exacting quality control procedures assure a constant, superior, uniform product.

In the history of the carbide industry, there has never been a higher quality product than new VR-75 steel cutting grade.

For complete information, call your local V-R representative or distributor, or write.

SEND FOR NEW BULLETIN . .

Get complete facts about this cost-cutting carbide today.



NEW VR-75 HAS

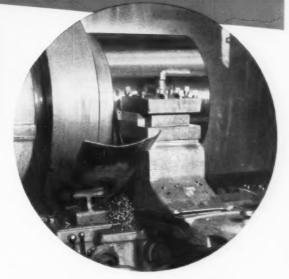
- High heat resistanceHigh shock resistance
- High edge strength



VR-75 Has Set Performance Records on Jobs from 1" to 36" Diameter

New VR-75 will increase production . . . minimize downtime . . . and drastically reduce tool costs on rough jobs like these:

- · Wheel turning
- · Roll turning
- High speed milling Crankshaft cheeking
- ... and many others.





886 Market Street • Waukegan, Illinois

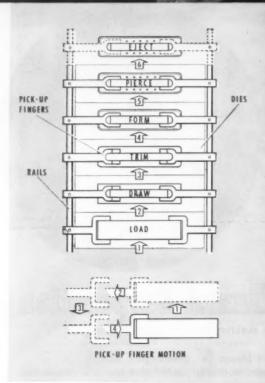
MANUFACTURERS OF CEMENTED CARBIDES, TOOLHOLDERS and TANTUNG® CAST ALLOY CUTTING TOOLS

AUTOMATE Your Press



Automobile oil pan produced from coil stock in six operations on straight side press. Press Pacer automatically transfers stampings from each die station to the next.





The Sheffield Press Pacer is a demountable mechanical transfer device which automates the straight side press while permitting its quick reconversion to conventional operation. It moves stampings from one die position to the next with each stroke of the ram—or from one press to the next.

The Press Pacer is completely mechanical in operation. It is driven by means of a lever arm bolted to the ram. The press so equipped may be fed from front to back or from right to left—loaded and unloaded either automatically or manually.

In a typical installation the Press Pacer enabled one press to handle three times the production previously turned out by six presses. In addition it eliminated work damage caused by moving parts from press to press. WITHOUT RESTRICTING ITS USE TO ONE PRODUCT BY MEANS OF THE



Press Pacer automatically moves these tarque tube flange stampings through 6 die stations on this large press.

COMPLETE FLEXIBILITY

The Press Pacer can be installed in a few hours. If any emergency makes manual feeding imperative, the Press Pacer may be demounted within minutes and the press operated in conventional fashion.

The Standard Press Pacer is built for presses with a bed area of 42" x 72" or larger, and a shut height of 14" or more—special units for smaller and larger presses.

Feed distance between dies for the **standard** unit may be varied between 8" and 36". Stroke adjustment has a range of 12".

Feed fingers and other elements may be readily revised to accommodate product changes.

Before deciding on a change in your press equipment, find out how much a Press Pacer would save you.

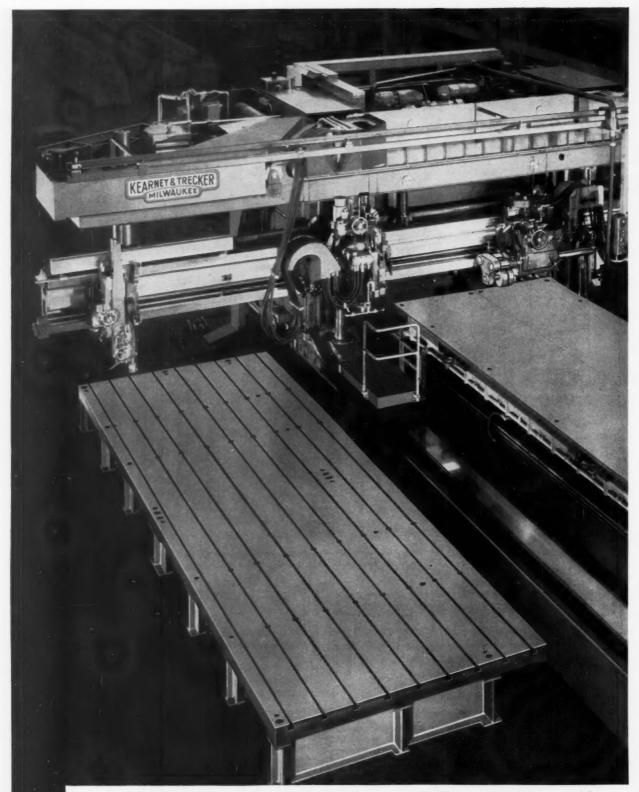
Send your part prints, press information and production requirements to The Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 9.

*Trade-Mark



7721R

MACHINERY, April, 1957-37



Designers and Builders of Precision and

Picture your workpiece on this 175-ton



gantry type milling machine

THIS massive giant, 42 ft. long, 35 ft. wide, is equipped with electronic tracer control system designed for production milling of intricately contoured workpieces. Rugged enough to mill all metals... sensitive enough to hold close tolerances... it meets all A. I. A. specifications and has extendable bed design. Gantry type machine takes much less floor space and permits handling larger workpieces or multiple workpiece setups. Machine incorporates standard design components with automatic programming control systems available.

For more specific information on this gantry type milling machine, have our representative call at your convenience...or write to Kearney & Trecker, Special Machinery Division, 6788 West National Ave., Milwaukee 14, Wis.



Special Machinery Division

MILWAUKEE 14, WISCONSIN, U.S.A.

Production Machine Tools Since 1898

MACHINERY, April, 1957-39



ARMSTRONG-BLUM MFG. CO.

5700 BLOOMINGDALE AVE. . CHICAGO 39, ILL.



40-MACHINERY, April, 1957

Production Pointers

from

CISHOLT

TIME-SAVING IDEAS



Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.











(1) 1/2" Flo-Set Speed Control Valve assembly; (2) valve body section and (3) valve body profile after first operation (1.35 min. f.t.f.); (4) valve stem after first operation (1.30 min. f.t.f.); (5) valve adjusting sleeve (completed in .85 min. f.t.f.);



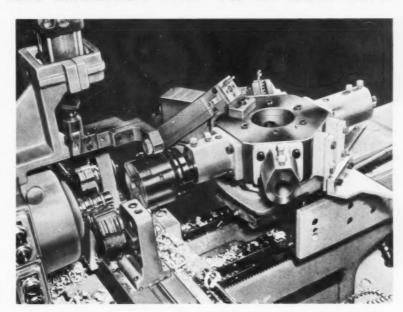
HANNA ENGINEERING CUTS MACHINING TIME 47% ON VALVE PARTS

Automatic cycle on ram type turret lathe reduces costs, boosts production, minimizes attention from the operator

This smart setup reveals how Hanna Engineering Works, Chicago, Ill., has stepped up production to an automatic basis with a variety of Flo-Set Speed Control Valve partsmachined from round and hexagon aluminum bar stock.

Average time reduction over former methods is 47%, using a Gisholt No. 5 Ram Type Turret Lathe equipped with a hydraulic drive unit which controls all machine functions.

Here's a typical fully automatic operating sequence on a 1/2 " size valve body (No. 2 above). A portion of the O.D. is formed by a circular cutter on the front of the cross slide. Hexagon turret tools start drill, finish 2 diameters and a taper in the I.D. with a step drill, form an internal recess and chamfer the I.D. with a turret slide tool actuated from a stop on the cross slide, and thread a portion of the O.D. The bar stock is unchucked, advanced to a headstock-mounted swinging stock stop, re-chucked, and the finished part is cut off from the rear of the cross slide while part of the O.D. on the next workpiece is formed by the same circular cutter. The cycle then repeats. Floor-to-floor time? Just 1.35 minutes.



Tooling close-up for 1/2" valve body. Note overhead swinging stock stop, and circular forming cutters on front and rear of cross slide.

Four different sizes of valve bodies and valve adjusting sleeves, and 3 different sizes of valve stems and valve collars are produced in this manner. Setup time is no longer than that for a standard hand-operated turret lathe. After completing setup, the operator simply removes finished parts, in-

spects, makes occasional tool changes or adjustments, and inserts new bar stock as required.

Hydraulic drive on ram type turret lathe offers continuous production without operator fatigue...assures high accuracy, consistent quality, maximum tool life through correct speeds and feeds on all operations.

MODERNIZE FOR PROFITS WITH



TIME-SAVING IDEAS

REMOVES 520 POUNDS IN ROUGHING THIS PART

Open side steadyrest solves clearance problems

Here's how one manufacturer takes advantage of the sheer power and rigidity of the 5L Saddle Type Turret Lathe, to cut machining costs on dificult parts. This 1190-pound steel turbine control valve casting is typical of what the 5L can do.

A special faceplate fixture—centralized and held in a 32" 4-jaw independent chuck—is used to locate, clamp and drive the part on the base end. Ample support during machining is assured by a turret-mounted live center and an open side steadyrest, mounted on the rear bedway and supported on a rail on the back of the bed casting. This type of steadyrest does not impede cross slide carriage movements, nor does it obstruct the tooling.

With this setup, all O. D. machining is handled from the compound tool post. Deep cuts are accommodated by special tool holders, giving maximum support to the overhanging tools. Hexagon turret tools re-center, start-drill and drill through the workpiece to complete the operation. In 197 minutes machining time the 5L, using a 75 hp. motor, removes 520 pounds of steel on this job.

Compound tool post on 5L proves rigid enough for heavy cuts, is ready to use for taper-turning operations on other parts.



Close-up of square turret tooling and open side steadyrest. Note fixture used to locate, clamp and drive part, which is approximately $36^{\prime\prime}$ long.





Workpiece before and after rough machining. Minimum clearance on deep cuts requires special tool holders on square turret for adequate support during heavy cuts.

SPECIAL TOOL BLOCK SOLVES TRICKY JOB ON IF FASTERMATIC

Woodruff & Edwards, Inc., uses triple-tooled automatic lathe to increase production

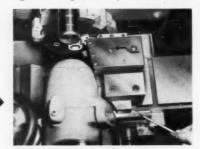


Close-up shows workpiece and two turret faces with tooling which turns, bores, chamfers, faces and reams to complete each part.

Cam-operated rear cross slide tooling from overhead. Arrow indicates path of tool travel.

Check this efficient setup. With it, Woodruff & Edwards, Inc., of Elgin, Illinois, uses the Fastermatic Automatic Turret Lathe cycle—to finishmachine 3 gray iron transmission tops with each complete index of the hexagon turret.

A special drawback fixture holds the workpiece, which is centralized and located on 2 dowel pin holes against the previously machined and



ground back face. Special drawback fingers clamp on the O.D.

Identically tooled stations 1, 3 and 5 turn the hub O.D., bore and chamfer while rear cross slide tools face the hub and flange bosses. Stations 2, 4 and 6 finish-ream the bore. The machine stops on stations 2, 4 and 6, the part is unchucked and a new workpiece inserted, and the machining cycle is repeated.

A tapered cam on the rear cross slide permits facing the flange and hub bosses without hitting the drawback fingers gripping on the O.D. The tool block moves in until the tooling clears the fingers; then the tapered angle of the cam moves a sliding tool holder within the block to machine the faces.

Triple-tooled turret on Fastermatic produces 3 finished parts for each index, with f.t.f. time of 1.08 minutes per part.



LOOK AHEAD... KEEP AHEAD... WITH GISHOLT

THE GISHOLT MASTERLINE

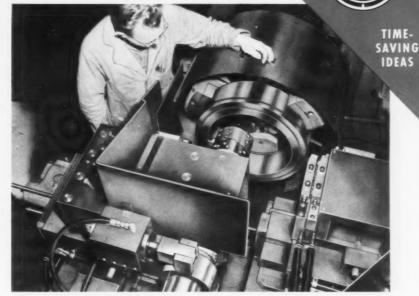
CALIFORNIA PELLET MILL CO. CUTS LARGE PART CHANGE-OVER

Simplifies operator's job with adjustable slides, special tool blocks, clamp-on tools on No.24

You'll spot smart planning in the way a wide variety of steel pellet mill die forgings—ranging up to 20¾" diam. —is machined by California Pellet Mill Co. at San Francisco, Calif., and Crawfordsville. Ind.

Rugged Gisholt MASTERLINE No. 24 Automatic Production Lathes perform 4 different operations on each workpiece. Work is held in a 28", 3-jaw air chuck. Plain chuck jaws hold the largest part; inserts and adjustable jacks add the flexibility to handle smaller parts.

Change-over from one operation to the other is fast, simple and low in cost. Front and rear tool blocks are quickly adjusted. Tool shanks are mounted in slots cut in the tool blocks. Longitudinal slots in the shanks permit fast in-or-out screw adjustment. To handle the required surfaces, the operator adds or removes necessary tool bits. For finish boring, a hydraulically operated off-center pivoting tool relief eliminates tool tracks. The 2-speed motor provides desired low speed for the deep grooving cuts. A



Finishing operation on 20 ¾" diam. part. Hydraulic cylinder at rear of front slide operates linkage to pivot boring tool off-center before withdrawal, eliminating tool tracks.

load meter on the headstock signals tool changes by indicating power increase requirements.

No. 24 completely roughs and finishes each

part in 4 operations: turning O.D., boring I.D., facing both ends, grooving and forming. Total f.t.f. time on 203/4" diam. part is only 24 minutes.

INDEXING TURNTABLE HOLDS IDLE TIME TO ONLY 18 SECONDS

Permits loading and unloading on Simplimatic while new part is being machined

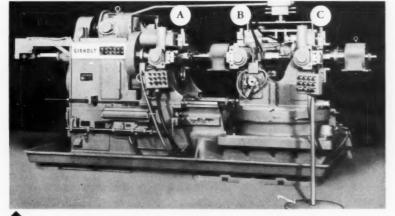
With this well-planned setup, the manufacturer is handling over 30 different sizes of electric motor frames. Three identical groups of tools are used, mounted on vertical heads A, B and C. Each group includes an independent rough and finish facing slide, and a rough and finish boring head.

Heads B and C carry expanding mandrels to permit chucking in the I.D. They are mounted on an indexing turntable, to permit loading and unloading operations at one end while machining is performed at the other. Head A traverses toward the turntable, with a special spindle arbor

mating with the mandrel to drive the part. A clutch at the base of head A engages a clutch at the base of the turntable, actuating the tooling, simultaneously machining the work at both ends. Head A reverse-traverses, disengages all driving clutches, and clears the turntable to permit indexing a new part into machining position.

Change-over is fast. Tool slides are repositioned and expanding mandrels changed. Dial indicators speed tool setting.

5,000-lb. turntable indexes and head A reverse-traverses and returns in 18 seconds—only idle time in entire operation. F.t.f. times range from .85 min. on $8\frac{3}{4}$ " O.D. workpieces to 2.34 minutes on 12" O.D.



Indexing turntable shows workpieces on both ends. Note head A retracted to permit indexing new piece into position.

Three different workpiece sizes, showing range handled with this setup.







TIME-SAVING IDEAS

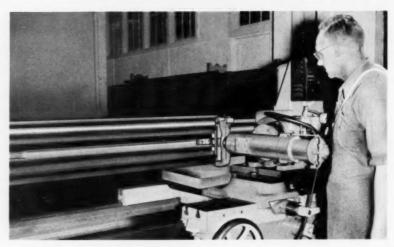
Mounts inexpensive attachment on lathe to save time, cut costs

Here's an interesting job that may point the way to better quality at less cost in your own finishing operations.

To prepare new and reconditioned artillery pieces for service, Erie Ordnance Plant, LaCarne, Ohio, frequently has to refinish galled or scored gun tube O.D.'s. Often the tubes meet drawing requirements, but still carry toolmarks perpendicular to direction of recoil—causing a filing action on the brass recoil liners.

To reduce refinishing time and obtain an improved surface finish, Erie Ordnance mounted a Gisholt No. 4 Superfinishing attachment on a lathe with enough capacity to handle all gun tube sizes. A typical part is the 155 mm. tube shown here, 12½" diam. by 64" long, with a smaller 10" diam. and a 64" length with a keyway. A special 3-stone holder permits Superfinishing over the keyways without difficulty.

ERIE ORDNANCE SUPERFINISHES 155 MM. GUN TUBES FOR LONGER LIFE



Special 3-stone holder used to Superfinish over keyway on 155 mm. gun tube.

With previous methods, up to 2 days were required for a single tube. With the modern Superfinishing attachment, 15 to 16 tubes are completed in two 8-hour shifts, varying slightly depending on surface conditions. All sizes are handled on same attachment by changing stone holders

and adjusting oscillation rates and stone pressures.

Superfinisher attachment reduces surface finish readings from as high as 50-60 microinches—including deep marks from galling and scoring—down to 8-12 micro-inches in minimum f.t.f. time.

BALANCES 77 FLYWHEELS AN HOUR, INCLUDING CORRECTION AND INSPECTION



Close-up of workpiece on adapter and integral correction equipment. Note that the correction radius may be easily changed by turning handwheel behind workpiece. This feature permits handling many different part sizes with minimum change-over time.

Gisholt 1SV1 locates, measures, corrects and inspects for unbalance in single handling

The trick here is to get high-production balancing on large-diameter, narrow-width parts requiring correction in a single plane. A Gisholt 1SV1 Vertical Balancer does the job easily.

The workpiece—an automatic transmission flywheel—is placed on a special adapter and rotated. The Direct Reading Amount Meter and strobe light, which indicates the angle of the unbalance, are mounted in one housing, permitting the operator to observe the angle and amount of unbalance simultaneously in the same visual field. To correct for unbalance he stops the spindle and positions the part for correction at the observed angle. He then lowers the drill, which actuates an air-operated thrust device

(visible on the left of the workpiece) to support during the correction drilling operation.

Drilling to the precise correction depth is made easy by calibrating the Direct Reading Amount Meter. The operator simply matches the reading with a simple scale on the drill press. Unbalance is usually corrected by drilling 3 holes or less, promoting the production of 77 parts an hour at 80% efficiency.

Correction equipment mounted integrally with Gisholt Balancer permits completing all operations in single handling.



THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT)

GISHOLT

Printed in U.S.A.

Madison 10, Wisconsin

TURRET LATHES . AUTOMATIC LATHES . SUPERFINISHERS . BALANCERS . SPECIAL MACHINES

You get what you want with

DANLY

PRESSES

WORKS MANAGERS

get presses that work a full shift ... every shift

Danly Presses are made to operate full time at top capacity...built with extra strength and extra rigidity. Oil circulates automatically to critical wear points all the time the press is running. Heavy bed bracing and extremely close glb alignment mean less die wear, longer runs without die regrinding. Danly accuracy and the exclusive Microinching Drive reduce hours to minutes during die try-out. Danly Presses can be installed and ready to go to work weeks soonerpipes, wires and controls are integral with the press.

NEW BOOK TELLS HOW MODERN PRESSES MAKE LARGER PROFITS POSSIBLE

"Industry's Wealth-Builders" tells how Danly Presses play an important role in corporate profits...growth...new plant

development...lower production costs. For your copy, write to DANLY MACHINE SPECIALTIES, INC., 2100 S. Laramie Avenue, Chicago 50, Illinois.



Wealth-Builden

DANLY

New Snyder Special Transfer Replaces Automation in Processing Forged Steel

Special Features of Snyder Machine No. 55-44

- 1. Production: 146 pieces per hour.
- 2. 26 Stations: 28 Operations per piece: 2 milling, 1 sawing, 4 hollow milling, 3 reaming, 1 countersinking, 10 drilling, 5 spotfacing, 1 threading and 1 tapping.
- 3. Palletized fixtures each carrying two parts.
- Parts quickly and accurately clamped and located and unclamped by combination torque wrenches and hydraulically operated mechanisms at Stations 1 and 26.
- 5. Ten individual base segments provide maximum flexibility for future part design changes.
- 6. Ample room between segments for tool changes and maintenance.
- 7. Motorized fixture return conveyor with fixture washing unit.
- 8. Ample chip and coolant facilities.

Standard Features of Snyder Machines

- SNYDER SELF-CONTAINED UNITS and other units equipped with hardened and ground ways.
- Threading and tap heads equipped with individual leadscrew spindles.
- Minimum downtime for tool changes because spindles are arranged for pre-set cutting tools.
- 4. Standard and special parts interchangeable for speed and economy in maintenance.
- 5. Motorized automatic lubrication system for all moving parts.
- 6. Construction to J.I.C. Standards throughout.
- 7. Master Push Button Panel and Light Console at Station 1.
- Each unit equipped with its own push button control station for ease of tool setup and manual operation of unit.
- 9. Electrical interlocks and full depth circuit throughout.
- 10. Panels equipped with SNYDER CIRCUIT SLEUTH.

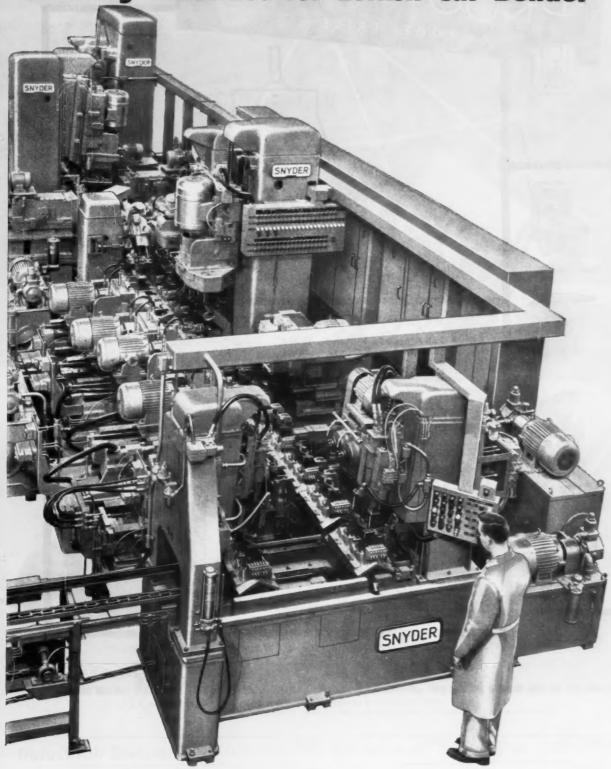
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TOOL & ENGINEERING COMPANY
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32 Years of Special Machine Tools with Automation



Several Semi-Standard Machines with Steering Knuckles for British Car Builder



DROODLES by ROGER PRICE





Bench Model BC-7D



Floor Model FC-30



Floor Model FC-14



Table Model TC-14 (Vertical Inspection)



"WELL-DRESSED COMPASS"

This delightful Droodle was inspired by an old photo of my Uncle Fred, showing him all togged out and rarin' to go in the 1924 Olympics in Constantinople. This disconcerted everybody, because the Olympic Games were being held in Paris. The explanation was that Fred had overdone things at a bon-voyage party with friends, and was tossed onto the wrong ship. Furious with embarrassment, he embarked on an epic binge involving pizza and beer. This barred him from the hop-skip-and-jump event, of course. But by exerting a little pull he wangled his way onto the tug-of-war team and heaved his way to a glorious victory.

While we're chatting here, I'd like to give you a few facts about the Jones & Lamson Optical Comparator, which can help you set new records for inspection efficiency. This marvelous instrument measures and inspects all sorts of work pieces and components, in a variety of sizes and shapes. The J & L Comparator is rapid, and accurate to .0001"; and it's so flexible, you'll be able to perform inspections that just aren't possible by any other method. Available in eleven different models, both bench and pedestal types. Write Dept. 710 today for complete information.

JONES & LAMSON OPTICAL COMPARATORS On the Job .



at Commercial Centerless Grinding Co., Cleveland, Ohio

This company, a well-known manufacturer of precision instrument parts, has been using J & L Comparators for years, to insure top quality control. A typical inspection piece is this valve pin, ½6" hex., ¼416 stainless steel, which is rapidly and accurately inspected after each grinding operation, and then checked out after final grinding.



"The originator of machine tool standards in optical inspection"

JONES & LAMSON.

JONES & LAMSON MACHINE COMPANY, Dept. 710, 512 Clinton Street, Springfield, Vt., U. S. A. Please send me Comparator Catalog 402-C, which describes the complete line of J&L Optical Comparators.

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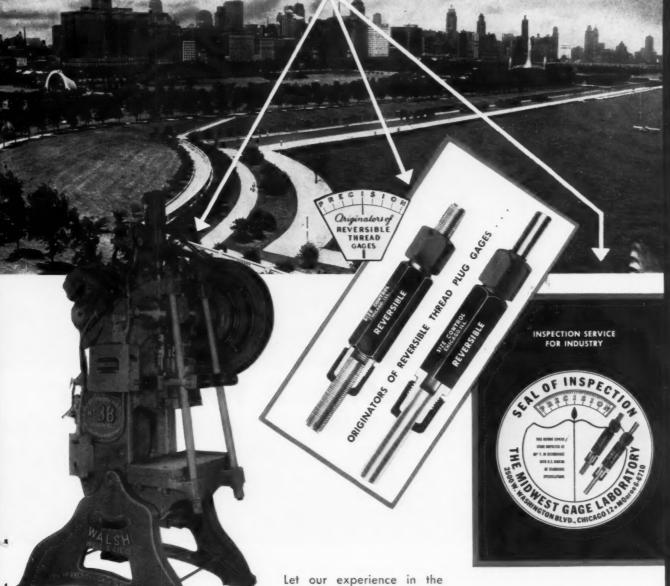
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From Chicago—the Heartland of America—these three leaders in their respective fields of production and precision can help you with your manufacturing problems.



WALSH 38-Ton Air-Clutch High Production O.B.I. Press

fields of production and precision prove beneficial to you and your product. Write or phone these Chicago firms for complete information about their important new products and services. In addition, all offer free engineering consultation

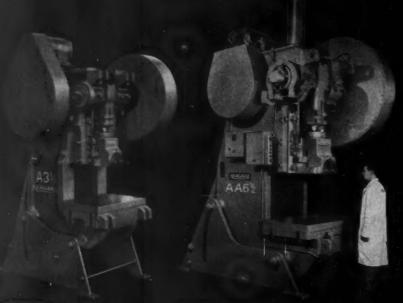
services. There's no obligation on your part, of course.

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SERIES A, 5 1/2 - 110 tons

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SERIES E, 75-200 tons Front-to-Back Crankshaft

READILY EQUIPPED TO HANDLE



THREE TYPES OF CLUTCHES

Each Niagara Inclinable features the clutch best suited for the purpose. (1) Famed Niagara multi-jaw mechanical sleeve clutch. (2) Exclusive Niagara multi-jaw Electro-Pneumatic sleeve clutch. (3) Niagara low inertia Electro-Pneumatic friction clutch.



Single Cylinder



Tandem Type

FOUR TYPES OF DIE CUSHIONS

Designed and manufactured by Niagara, single cylinder and tandem type pneumatic die cushions are built in 4 types to make any Niagara Inclinable a double action press. Self-lubricating models are available for automated OBI's,



EQUIPPED FOR AUTOMATION

Featuring the most advanced controls and devices, Series EA (automated models) are engineered for peak productive capacity. Here's a line of OBI's that is completely equipped by Niagara for operation in your automation lines.



POWER INCLINING DEVICE

Fast-acting, safe and easy to operate, Niagara's air motor inclining device (shown above) is furnished as an optional accessory. SPECIAL BOLSTER PLATES

J.I.C. CONTROLS FLANGED SLIDES

POWER SLIDE ADJUSTMENT

FLYWHEEL BRAKE

DIE AREA LIGHTING

MOTOR CUTOUT SWITCH

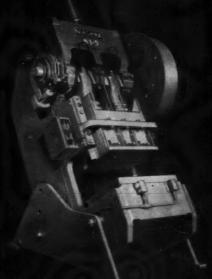
WIDE CHOICE OF ACCESSORIES

With a full selection of modern press accessories available, Niagara Standard Inclinables are adaptable to the widest possible range of job assignments,

standard OBI presses in <u>all</u> sizes and types that are right for you!



SERIES EA (Automated), 75-200 tons Front-to-Back Crankshaft



SERIES BI, 60-200 tons Double Crank

5 LINES . . . 34 MODELS EACH A CHAMPION IN ITS CLASS:

Niagara offers you industry's most complete, most modern, and most exclusive selection of standard inclinables . . . plus an unequaled choice of press accessories and automatic devices to meet your specific job requirements. You can count on Niagara for inclinables that will do the most to speed production, assure accuracy, prolong die life and hold down maintenance costs within your plant.

YOUR WORK MOST PROFITABLY



Manual



Automatic



Automatic Circulating



CENTRALIZED LUBRICATION TO FIT THE NEED

Niagara Inclinables are readily equipped with either manuallyoperated or automatic lubricators, or automatic circulating oil systems. It's one of the many ways in which Niagara outfits standard inclinables to meet individualized requirements.

ALL TYPES OF AUTOMATIC FEEDS

To speed production, Niagara Inclinables are easily equipped with complete, automatic feed arrangements: single roll, double roll, dial, chute, magazine and specially engineered types. Variable speed drives can be provided to allow adjustment for the optimum speed consistent with the die, material and feed length.



GET ALL OF THE FACTS on any or all Niagara Inclinable Presses. Consult with a Niagara representative. His recommendation will be impartial. He has all types of OBI's to offer. At your request, specific Bulletins on each series, containing complete information and specifications, will be mailed to you promptly

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Precision by the Truckload - - they're Blanchard ground!

This truck is loaded with 14 tons of steel. Its cargo is 33 soft steel plates, each measuring 271/2" x 251/2" x 11.125", and ground to ± .001" on a Blanchard Surface Grinder.

Dies up to 84" across corners, can be ground on a Blanchard at great savings. Grinding can be controlled without guesswork - leaving a flat, sharp die -as soon as the entire surface is cleaned up. Die resharpening on the Blanchard allows you to get maximum life from your valuable dies and end plates.

Ask for details on the 15 standard Blanchard models.

For best results in surface grinding . . .



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Gentlemen: Please send me a free copy of "The Art of Blanchard Surface Grinding" (3rd edition) and "Work Done on the Blanchard" (5th edition)

We eliminated the need for drill jigs

witha

BULLARD

Stager -

One of the leading manufacturers of machinery and equipment for the mining industry, employs the Bullard Spacer Table to locate parts for drilling, reaming and tapping.

According to the Assistant Factory Superintendent, "the Bullard Spacer Table eliminates the need for layout and is more accurate thereby saving jig cost and re-work time."

If you drill, ream or tap in your manufacturing, it will pay you to investigate the advantages of a Bullard Spacer Table.



Call your nearest Bullard Sales Office or write

THE BULLARD COMPANY



A Unionmett flexible welder simplifies and speeds fabrication of railroad hopper car.

Wherever flexibility and maneuverability are required in welding, the UNIONMELT flexible welder far outperforms rigid, mechanical installations . . . Welding in corners and in tight spots is no problem with this sturdy portable unit, and top quality welds are produced at speeds up to 40 inches per minute in many operations. The combination hopper and welding head is lightweight, and requires no special skill to operate.

Combines Advantages

This Unionmelt flexible welder combines the speed of

mechanized installations with the operational freedom of manual welding. Wire feed unit and controls are mounted on a mobile carriage which can be moved quickly from one job to another, or from point to point on the same job. Initial investment for flexible welding equipment is considerably less than for stationary automatic welding installations—operations are economical, and maintenance costs are low.

For more information on this and other modern methods for joining metals, call your local LINDE representative, or write for free illustrated literature.

Linde Air Products Company

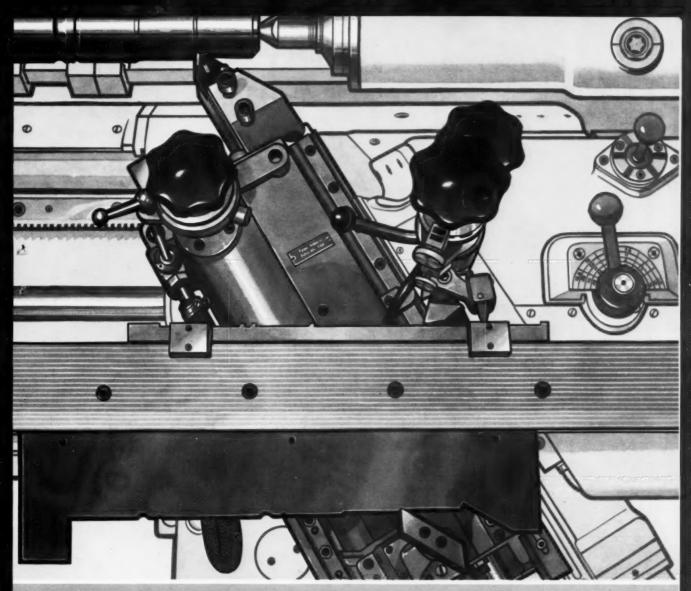
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New Britain +GF+ outproduces

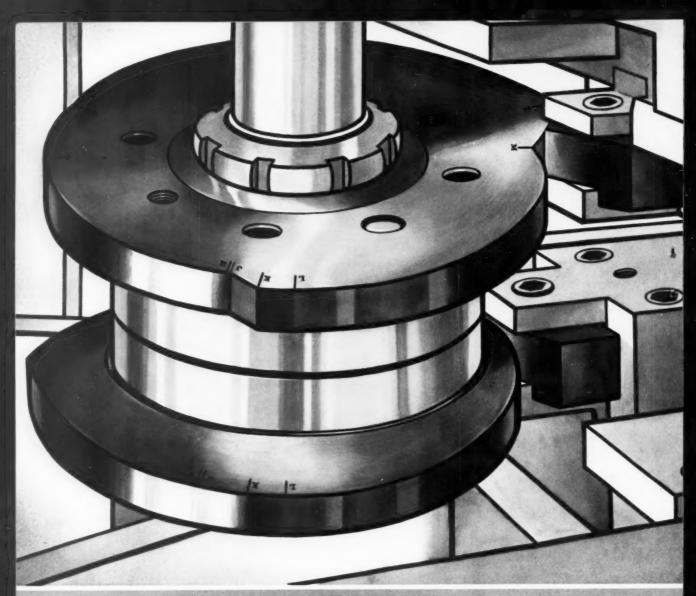
multi-tool lathes with a single tool

How can one tool outproduce several? The answer is — maintain dimensional relationships with a template or prototype instead of a multi-tool setup. This cuts tool changeover time to practically zero.

On the New Britain +GF+ copying lathe, you can cut at maximum speeds and feeds for tool efficiency without worrying about tool wear and the delicate readjustment of several cutting tools. When the tool wears, change it, bring one dimension to size. The other dimensions have to be right. Your choice of a New Britain +GF+ means elimination of any extra operation to bring pieces within grinding tolerances.

Machines from New Britain's three machine tool divisions incorporate the basic principles of more profitable production.





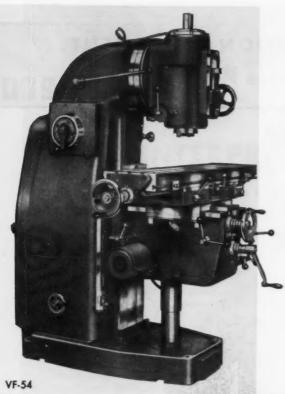
cams put the precision

in precision boring

When you are working to "tenths" cams are your best method of maintaining accuracy, because cam control of the tool is *positive* control. The accuracy of parts produced on New Britain boring machines *can't* be affected by variable hydraulic pressures, ambient temperature, or play in complicated linkages.

In boring machines or *any* machine tool investment, be sure your most important requirements are met, not by gadgets, but by the fundamental design principles employed. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.





ONLY SWEDISH CRAFTSMEN

Can Build These Precision Millers
At Such Surprisingly Low Cost



HORIZONTAL AND VERTICAL SAJO MILLERS

Built to U.S. Standards, Sajo Millers with proven production records in modern industry are available in both plain and universal models. Installation references in your vicinity on request.

Standard Duty #2 (Model 54) ALL GEARED Millers—

Plain, Universal and Vertical—table 52" x 11", 7½ HP with power feeds (longitudinal 33½") and power rapid traverse.

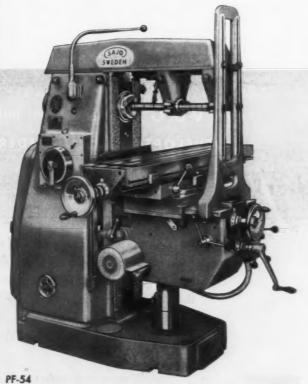
Light Duty #2 (Model 53) ALL GEARED Millers—

Plain and Universal—table 41%" x 9%"

—3½ HP with power feeds (longitudinal 24½").

Light Duty #2 (Model 48) Utility Millers—

Plain and Universal—table 41%" x 9%" -3% HP with power feeds (longitudinal 24%").



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76-E MAMARONECK AVENUE • WHITE PLAINS, NEW YORK

HORIZONTAL AND VERTICAL SHAPERS . POWER HACKSAWS

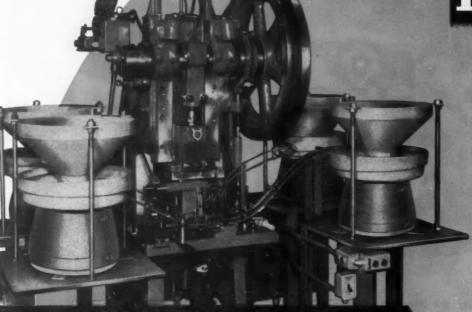
FAST SERVICE AND PARTS AVAILABLE FROM MAJOR CITIES, WRITE FOR CATALOGS

For more information fill in page number on inquiry Card, on page 255

MACHINERY, April, 1957-51

PRODUCTION EQUIPMENT...

produces MORE with



NOW V & O PRESS equipment includes

DEVELOPED PEECO FEEDERS

Illustration shows the $V \in O$ inclinable press with four PEECO vibratory parts feeders and orientation track escapement. This $V \in O$ equipment, with ring type dial feed, automatically transfers four finished components for assembly at 70 SPM.

PEECO, the leader in the field of vibratory parts feeders, is contributing its share toward the greater capacities being achieved by new production equipment. We are glad to include, among the companies in this field now being served by PEECO, the V & O PRESS COMPANY, a division of Emhart Manufacturing Company of Hudson, New York, pioneers in automation since 1889.

If you want to produce more, send for bulletin #635 and ask for the name of the PEECO representative in your area.

Seco.

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF VINRATORY PARTS FEEDERS

PERRY EQUIPMENT & ENGINEERING CO.

ERIE, PA. . . . DIVISION OF AUTOMATION DEVICES, INC.

(1)

FREE ENTERPRISE IN 24 NATIONS UNITED...

on Choice of Yoder Mills for Pipe and Tube Manufacture

It all started less than two decades ago with the introduction by Yoder-and the rapid adoption by American industryof a revolutionary new type of mills for cold forming and electric-resistance welding of pipe and tubing. England, France, Italy, Mexico, Argentina, and Brazil soon followed the U.S.A. in adopting Yoder mills. Most other countries which boast any kind of modern metal working industry also invested in one or more Yoder mills, including distant Japan, India, and South Africa. Production, depending on requirements, varies from 25,000 up to 75,000 feet per 8-hour shift.

By this time, England, Italy and Argentina each have a total of ten Yoder mills in operation; Brazil, eight; Mexico, six; France, five; other countries somewhat in proportion to their population. In many nations, Yoder mills now supply

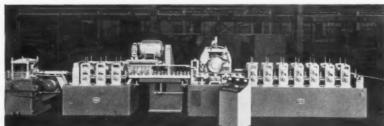
from 50% to 90% of all the welded tubes used.

The geographical distance which separates Yoder from many of these countries has proved much less a handicap than might be supposed. Reasons: the simplicity of design, ease of operation and dependability of Yoder mills. Secondly, generous assistance rendered by Yoder in training operators everywhere. In fact, several outstanding production records have been scored by operators in foreign countries, most recently in Italy.

Through technological advances, Yoder leadership in tube mill design has been jealously preserved and strengthened from year to year. Ask for literature giving details of the latest improvements. Correspondence invited.

THE YODER COMPANY

5504 Walworth Ave., Cleveland 2, Ohio, U.S.A.







PIPE AND TUBE MILLS-Electric Weld

ROTARY SLITTING LINES COLD ROLL FORMING MACHINES

CANADA

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BELGIUM

MEXICO

AUSTRIA

INDIA

ISRAEL

BRAZIL

MALY

GERMANY

URUGUAY

ENGLAND

You can expand your plant,

for production men

This Avey machine drills various patterns of holes in jet engine parts by changing program drums or by alternating two automatically-driven locators which position the table accurately from a radial position. Program drum also programs one or more of the four drilling units for drilling, reaming, and similar operations.

The machine consists entirely of standard Avey units: four Aveydraulic automatic units with 12" feed; cast iron columns; 120" fan type steel base; 60" Electrodex table. Top column and unit have an in-and-out traverse of 20". The ways are mounted on steel adaptor blocks which can be removed for different heights.

All units and the index table are push button-controlled.

If you're looking for flexibility in a special machine, your Avey man's the man to see.

for management

The pressure to expand is terrific on managements who want to be prepared for the rocketing market growth predicted for the next 10 years. They realize that they will probably lose ground by standing still, but they also want to protect their balance sheets, and their peace of mind, from heavy debt due to adding costly plant space.

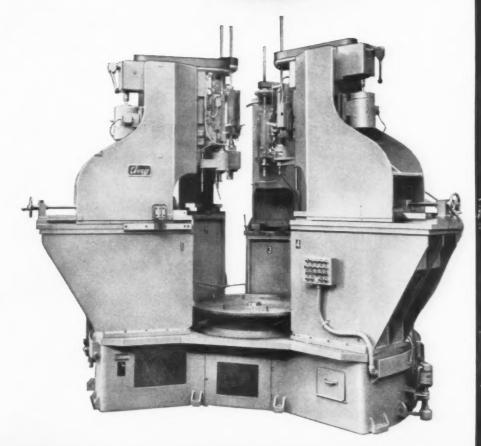
Avey production machines offer a quick and economical means of achieving the primary objective of expansion: increased productive capacity. They concentrate many operations in a comparatively small area, and free both floor space and labor for other productive operations. Their production rate enables you to increase your sales volume; and their fast pay-off rate gives you substantial earnings on your investment in a short time. Their unitized construction permits economical re-engineering to handle new parts or design changes.

THE AVEY DRILLING MACHINE CO., CINCINNATI I, OHIO

drilling, tapping, production machines

and sleep well too

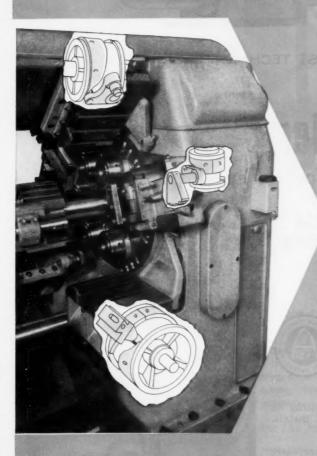




more power

1 %" RB-6 Acme-Gridley with eccentric turning and forming attachments.

Acme-Gridley independently-operated direct cross-slide camming



Lets you use maximum machine horsepower for rapid metal removal—without chatter and at predetermined accuracy—throughout an entire run. Basic design of Acme-Gridleys built for heavy cuts calls for proper distribution of "beef" in the machine frame to rigidly support top, bottom and intermediate slides so that they can transmit power to the tip of the tool with no linkages.

Cross slides operating from their own cam drums not only improve overall machine efficiency, but extend the range of applications for which the machine can be tooled. And when, as in the case of Acme-Gridleys, ample frame strength is combined with short coupled power transmission to the tool, you've got a combination that pays off in two ways—improved performance and reduced maintenance.

LET US TELL YOU MORE ABOUT Acme-Gridley BASIC DESIGN

Independently-operated, direct camming is but one of many BASIC DESIGN features which are responsible for Acmo-Gridley's autstanding performance records. May we send you additional information? Or, better yet, let us send a representative to discuss possible production short cuts with you.

National Acme

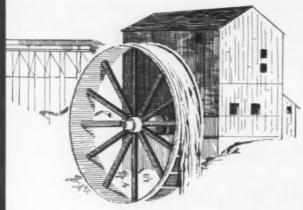
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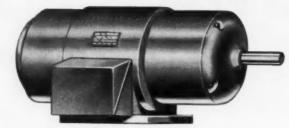
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Great in its day...



BUT

WOULDN'T YOU

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Now . . . from Heller

Another great technical advance in tools . . .

"Tob Tempered" Metal Cutting Band Saws

Certified by American Standards Testing Bureau* to meet their standards for superior cutting — Uniform Teeth . . . Uniform Set . . . Uniform Temper

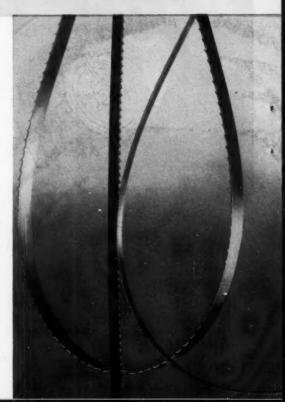


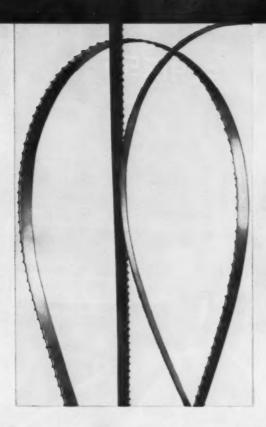
There's a new way to achieve smoother, faster cutting on band saw machines, with longer life on a variety of metals. Heller's "JOB TEMPERED" Metal Cutting Band Saws.

Heller's exclusive metallurgical and heat treating processes that have won these blades the name "JOB TEMPERED" have also earned them American Standards Testing Bureau's Certification. This is your assurance that these blades meet the three prescribed standards for superior cutting . . . uniform teeth . . uniform set . . . uniform temper. As a result, when you use the right Heller Blade for the job, you're sure of superior cutting every time.

Heller "JOB TEMPERED" Hard Edge Band Saw Blades are available in all tooth shapes . . . Standard Tooth (Regular or Wavy Set), Skip Tooth and Hook Tooth. Saws are available in all standard widths and tooth spacings . . . in 100' and 250' coils or welded to specified lengths for use on all type machines.

High Speed Steel Band Saws are also furnished for specific applications.













FLAT GROUND DIE STEEL

FAMOUS HELLER FILES

HELLER

America's oldest file manufacturer

TOOL CO. Newcomerstown, Ohio A subsidiary of Simonds Saw and Steel Co.

Give us your toughest band sawing problems

If you've been having trouble, let us show you how the right JOB TEMPERED metal cutting band saw can give you better cutting, longer service and greater economy.

Here are the facts!

Heller's new catalog of JOB TEMPERED metal cutting band saws contains full description of types of blades, tooth designs and set. WRITE FOR YOUR COPY TODAY.



SOLD EXCLUSIVELY THROUGH YOUR OUTSIDE TOOL ROOM



"Our Schiess vertical boring mill DOES THE JOB 3 TIMES FASTER, MORE ACCURATELY, with a BETTER FINISH!"

Hahn Manufacturing Company, 5332 Hamilton Ave., Cleveland

Jobs of increased size and time limitations no longer hold back production at Hahn Manufacturing Company.

The company reports: "Our Schiess machine has already handled a 60" high cast iron cylinder and a 108" diameter ship propeller. We cut production time by using the two boring heads together. For instance, one head can be used for roughing while the other is finishing. Or one head can be used for turning while the other is boring.

"Our operators claim the machine is just about foolproof. They like the cross-rail electro mechanical controls. They also praise the hydraulic pre-selection of speeds, the finger-tip control for direction of feed and rapid traverse, and the all-vertical gear drive. Another thing—no special training

was needed. Our regular machinists put it right to work as soon as they learned the controls.

"The Schiess mill does our big jobs just about three times faster, provides a better finish, is more accurate and results in less spoilage."

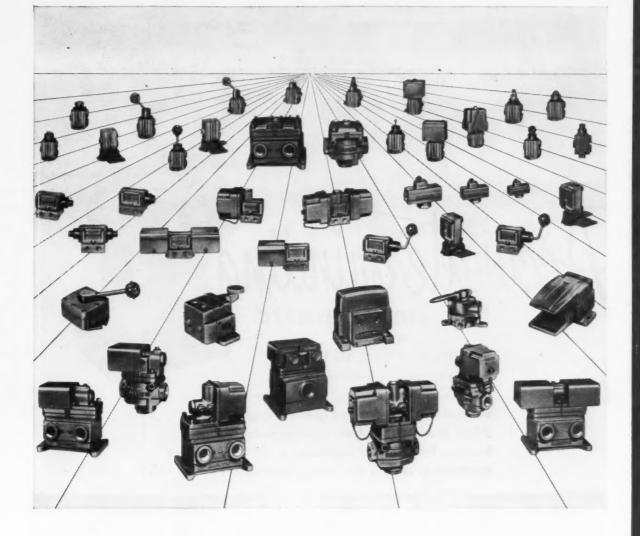
Get to know this product of Europe's largest builder of heavy machine tools. Parts and service are as close as Pittsburgh. An American Schiess engineer will be happy to help you size up this heavy producer for your heavy production needs.

Write for catalog and complete specifications.

Standard Model KZ Double Column Vertical boring mills are available with 80", 98" and 118" turning diameters.

SCHISSS

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These valves <u>like</u> tough jobs

Discriminating engineers are finding that out. More and more of them are specifying Hannifin valves for every kind of directional air control—including the really tough jobs.

There are plenty of reasons why: Inspired simplicity of design. Fewer parts—and those easily and quickly

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Your Hannifin man will gladly give you the whole story. We'll tell you where to get in touch with him—after you examine the big Hannifin catalog.

AIR CONTROL

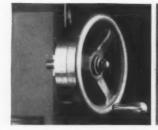
HANNIFIN

VALVES

For this complete catalog showing all the Hannifin directional air control valves, write to Hannifin Corporation, 509 South Wolf Road, Des Plaines, Illinois.







ACCURATE SPINDLE ADJUST-MENT—Standard vertical adjustment of spindle through handwheel is .0005". With Vernier attachment, spindle can be raised accurately to .00005".



SOLIDLY SUPPORTED SPIN-DLE CARRIER — Spindle carrier is moved vertically on double dovetail ways with adjustable tapered gibs.



CONVENIENT HAND CONTROL—Handy wheels for cross travel, accurately gauged to thousandths, and quick acting longitudinal travel.



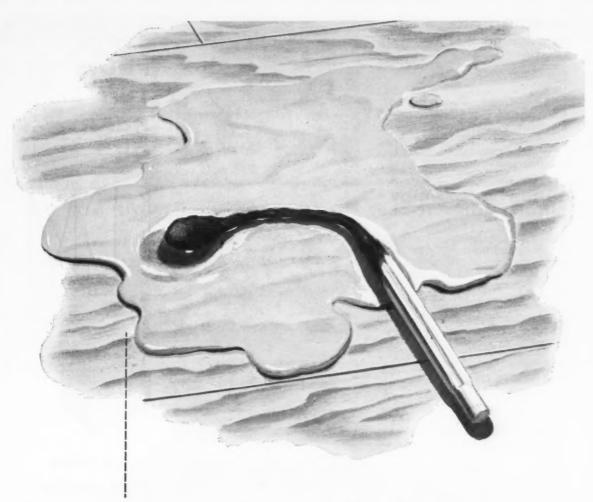
4

SMOOTH ROLLER CHAIN TABLE DRIVE—Remarkably smooth finish on work without chatter marks frequently found when table is moved by conventional means through rack and pinion.

Write or wire for further information.

THE FOOTE-BURT COMPANY · Cleveland 8, Ohio · Detroit Office: General Motors Building

FOOT BURT



An economical hydraulic fluid that actually snuffs out fire!

Wherever a fire hazard exists near a hydraulic system, you can greatly reduce this hazard without excessive costs by specifying Shell Irus Fluid 902. This new hydraulic fluid is a "snuffer" type fluid with water dispersed in oil.

Because Irus* Fluid 902 is economical, many plant operators have found they save thousands of dollars yearly

when the changeover is made. And they obtain performance which is unsurpassed by much higher priced fireresistant fluids.

For complete information on Shell Irus Fluid 902 write to Shell Oil Company, 50 West 50th Street, New York 20, N. Y., or 100 Bush Street, San Francisco 6, California.

*Trademark

SHELL IRUS FLUID 902



FORGING DIE

Material: Heppenstall 'A' Conventional Machining

Time: 40 hours

Elox Setup & Machining

Time: 8 hours Saved: 32 hours

Machine tool: Elox Standard M-500 Electrode: Cast Elo-met #3

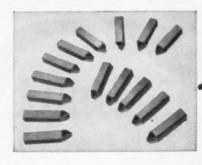
Customers report 75% time saving in re-working dies after washout... no annealing is necessary.

FROM THE HEART OF

water from make the form the second of the s

TUNGSTEN CARBIDE SINGLE POINT TOOLS

E D M produces 14 identically machined tools per hour. Times include roughing and finishing, machining both faces, nose radius and top. Radius held to ± .001". Tools were produced by 1 man operating 2 Elox Tool & Cutter Grinders, using a brass wheel. Users report Elox ground tools give greatly increased life when compared to abrasive ground tools.



EDM

*

Various from the contraction of the contraction of

EMBOSSING DIE

Material: Air Hardened Tool Steel Die consists of 1,250 squares machined .100" x .030" deep in the bottom section of the die. Sharp corners on each square had to be maintained.

Conventional Machining

Time: 227 hours

Elox Setup & Machining

Time: 10 hours Saved: 217 hours

Machine Tool: Elox Standard M-500 Electrode: Free machining brass

...4 jobs that prove

Elox puts you ahead of competition

solventral popular properties of the second popular po

EXTRUSION DIE

Material: Air Hardened Tool Steel

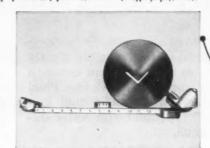
Conventional Machining Time: 4 hours

Elox Setup &

Machining Time: 1 hr. 38 min.

Saved: 2 Hrs. 22 min.

Machine Tool: Elox Standard M-500 Electrode: Free machining brass Machining is done after final heat treating . . . eliminating the possibility of distortion.



These jobs were done for Elox customers in our "Prove It" Division. There's more to them than just "man hours" saved. The Elox sales engineer in your area would like to give you all the details about these and other applications of Electrical Discharge Machining. Why not write . . .

Corporation of michigan

1833 N. Stephenson Highway Royal Oak 3, Michigan



NOTHER machine in the MIKRON line—Controlled Accuracy, High Finish, Ease of Set-Up. The precision cutter shapes as it generates tooth forms. The work meets your most exacting specifications and standards. Gear production requiring a shaping operation will be ideally performed with the MIKRON No. 134.

WORK PIECE CAPACITY

RACKS

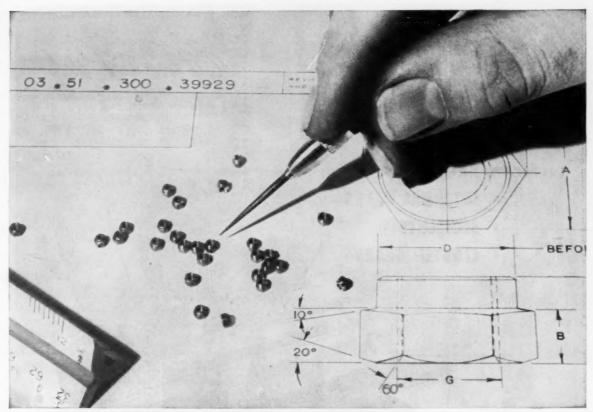
(Straight or Skew) to 36" long x 1" wide.

SEGMENTS & CLUSTERS to 3 % " dia. x 1" wide.

INTERNAL GEARS
to 4" dia. x 1" wide.

BUSSELL, BOLBROOK & BEINDERSON, INC.

292 Madison Avenue, New York 17, N. Y.



FIEXLOC MICROSIZE locknuts meet designers' needs for tiny precision nuts that retain strength and holding power in the smallest assemblies—servomechanisms, electronic and electrical equipment, all miniature devices.

New FLEXLOC Microsize Locknuts

Now available in Alloy Steel, Stainless Steel, Brass and Aluminum for lighter, more compact designs

SIZE	Across Flats		Shoulder Height		Across Corners	Height
	MAX.	MIN.	MAX.	MIN.	MIN.	003
0-80 NF-3B	.111	.107	.047	.042	.123	.075
1-64 NC-3B	.127	.123	.0635	.0585	.141	.090
1-72 NF-3B	.127	.123	.0635	.0585	.141	.090
2-56 NC-3B	.158	.153	.068	.063	.176	.105
2-64 NF-3B	.158	.153	.068	.063	.176	.105
3-48 NC-3B	.190	.183	.071	.066	.210	.120
3-56 NF-3B	.190	.183	.071	.066	.210	.120
4-40 NC-3B	.190	.183	.072-	.067	.210	.120
4-48 NF-3B	.190	.183	.072	.067	.210	.120

SPECIFICATIONS: Available in brass (plain or cadmium plated) and aluminum (plain or chemically treated), for temperatures to 250°F; alloy steel, 18-8 stainless, for temperatures to 550°F.



New FLEXLOC Microsize locknuts are smaller and lighter than regular FLEXLOCS of the same nominal diameter. Wrenches of smaller size are used to install them. Mating joints or flanges can be designed smaller—with no loss

in strength or convenience of assembly.

Microsize Flexlocs have all the advantages of larger Flexlocs. One-piece, all-metal construction—nothing to put together, come apart, lose or forget. Use them as lock or stop nuts—they stay put anywhere on a threaded member as soon as the locking threads are fully engaged. Uniform locking torques insure accurate preloading. There are no nonmetallic inserts to pop out or deteriorate. Moisture, dryness, oil won't affect these Microsize Flexlocs. Just screw them on. They lock and stay locked. Vibration won't shake them loose.

For complete information on Microsize Flexlocs, consult your authorized SPS distributor. Or write STANDARD PRESSED STEEL Co., Jenkintown 19, Pa.

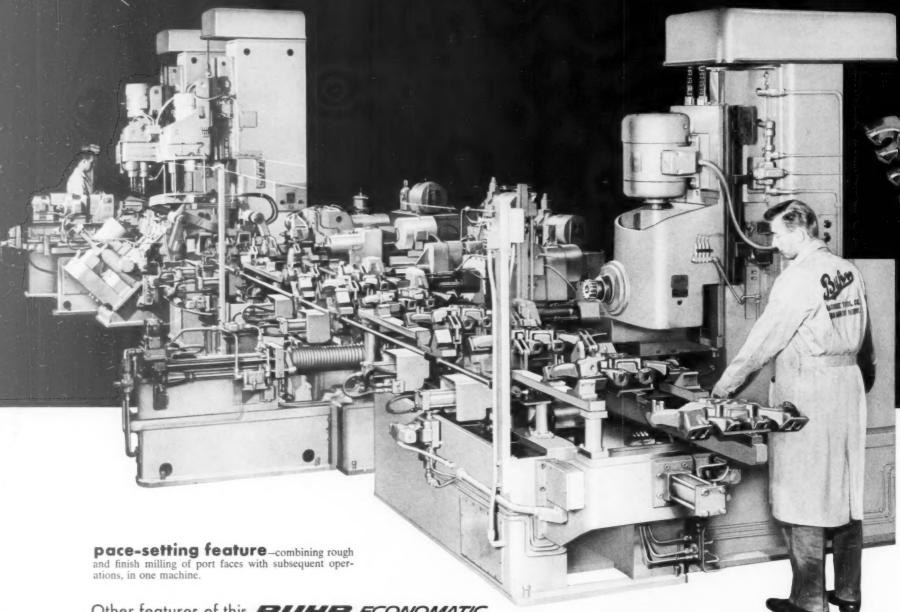
STANDARD PRESSED STEEL CO.

FLEXLOC LOCKNUT DIVISION





BUHF ECONOMATIC sets precedent by



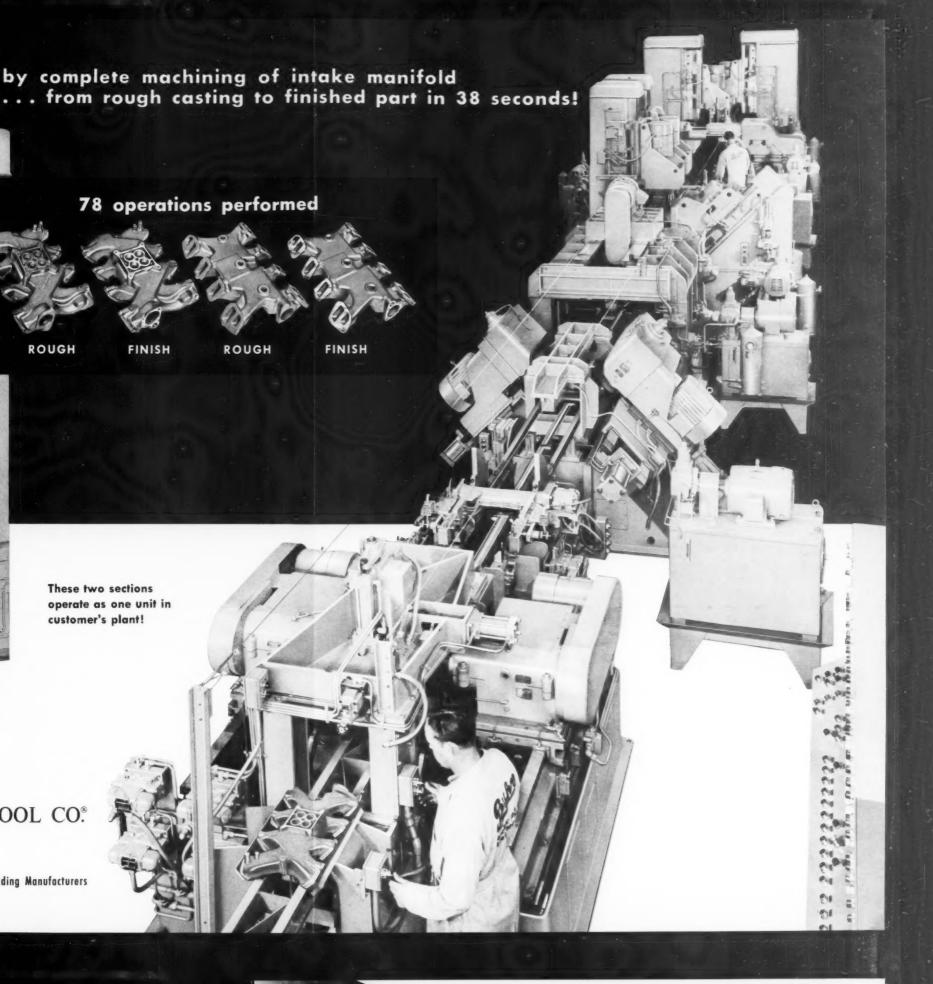
Other features of this BUHR ECONOMATIC

- parts may be banked between the two sections to minimize downtime during tool changes
- · central graphic control panel
- · exclusive Buhr detector system in main console
- · J.I.C. Standards throughout
- · special Buhr sectional-base construction to facilitate future part-changes
- · standard and special parts interchangeable for ease of maintenance
- · spindles arranged for pre-setting of cutting tools
- · hardened and ground steel ways
- · central mist-lubrication on all heads
- · automatic lubrication of all moving parts
- · automatic probing stations

BUHR MACHINE TOO

ANN ARBOR, MICHIGAN

Solidly Engineered · Precision Built · for World's Leading





setting the pace in modern

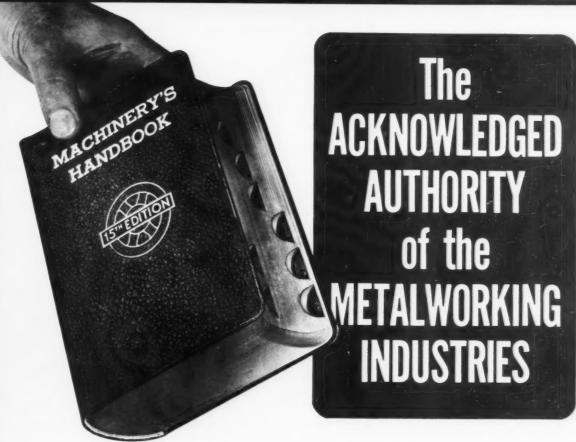
ECONOMATION

"ECONOmical autoMATION"



sets precedent...





with over a million copies sold, MACHINERY'S HANDBOOK has been the indispensable reference book for designers and builders of mechanical products. Now the 15th Edition, with over 400 pages revised and brought up to date, gives you the latest and most authoritative information on present-day designing, manufacturing and metalworking practices.

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A modern handbook is a necessity for every man who holds or hopes to hold a responsible job in the mechanical industries. Shop men, as well as engineers and designers, find MACHINERY'S HAND-BOOK invaluable. It contains the kind of information that is needed wherever machines, tools, and mechanical devices are designed or constructed.

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Does your present Handbook give you today's answers? The 12th Edition of MACHINERY'S HANDBOOK was published in 1943—only 12 years ago—but . . . 474 pages were revised and 96 pages were added to provide new material for the 13th Edition in 1946. Then . . . 290 pages were revised to provide new material for the 14th Edition in 1949. And now . . . 432 pages have been revised to make the New 15th Edition better than ever and ready to help you tackle the problems of today.

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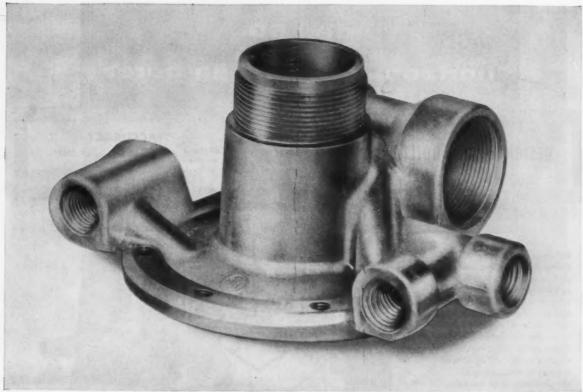
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THE INDUSTRIAL PRESS 93 Worth Street, New York 13, N. Y.





Anaconda Die Pressed Brass Forging after machining, ready for assembly in the gas-pressure regulator shown below.

Better regulators at less cost—with die pressed forgings

Save 25% in first cost—cut machining time, tool cost

Smith Welding Equipment Corp. of Minneapolis uses Anaconda Die Pressed Brass Forgings for gas-press-



Smith's two-stage oxygen regulator, Model H313. One of the Smith Welding Equipment Corp. products using Anaconda Die Pressed Brass Forgings.

ure regulator bodies as a result of the following analysis of the job.

First, die pressed forgings make a superior product because the twicewrought metal has the uniformity, denseness, toughness, and strength to prevent gas leaks and to withstand pressures that run in excess of 2500 psi. And second, the forgings do the job economically. The initial cost of the die pressed forging is 25 percent less than the cost of sand castings. In addition, savings are realized in substantially reduced tool costs and machining time. And finally, the forgings are finished in a simple bright-dipping operation, with savings over sand castings estimated at 5 cents a unit.

SHORT CUTS: Anaconda Die Pressed Forgings are short cuts to superior products. Because of their high strength, hardness and resistance to impact, abrasion, and corrosion, they serve better functionally, often replacing more costly built-up assemblies of cast, stamped, drawn, or other machined parts. Their consistent accuracy of dimension eliminates most surface machining to size, permits trouble-free use of drilling jigs. threading or milling fixtures, broaching vises in secondary operations. They are ideally suited to high-speed automatic chucking machines.

The die pressed forging technique is practically unlimited in diversity of shape and field of application. Specialists at The American Brass Company will be glad to submit estimates on the cost of forgings for your critical components. Just submit a sketch or sample of the part involved—or write for Publication B-9. Address: The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Limited, New Toronto, Ontario.

ANACONDA® COPPER ALLOY DIE PRESSED FORGINGS

Short cuts to superior products

dixi 60

horizontal optical jig borer

with 5 optical microscopes

DESIGNED AND BUILT FOR: Optical settings for operations in all planes

VERSATILITY

and compound angles . . . Equally suitable for tooling, short-run or production work . . .

ACCURACY

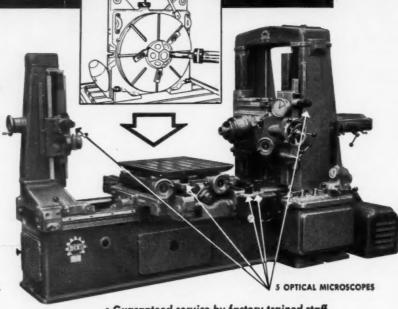
Overall accuracy of .0002"

A precision machine for JIGLESS boring, facing, milling, and drilling work, in all planes. Built-in 360° optical rotary table, 28%" x 32%" All spindle and table settings by optical microscopes. Infinitely variable hydraulic feeds. Mechanical spindle feeds with automatic depth stop. #40 taper spindle-speeds infinitely variable to 1400 R.P.M. Special features eliminate effect of spindle overhang on accuracy.

DIXI 450 PRECISION OPTICAL CIRCULAR DIVIDING TABLE

Direct readings of 1 sec.

(See insert picture above) rigidly mounted (not tilting) on built-in rotary table permits holding close tolerance relations between bores in all planes, including bores at compound angles. ALL IN ONE SET-UP. All sides of the work piece except the mounting face machined in one set-up.



- Guaranteed service by factory trained staff
- Engineering staff available for consultation
- · Spare Parts in New York stock
- · Your operators trained

DIXI 60 now in wide use in leading Aircraft and Manufacturing Plants throughout the United States.

Names available upon request.

SEE THIS **VERSATILE MACHINE** IN OPERATION

at our New York or Cleveland Show Rooms. Write for Complete descriptive literature and prices to Department 21. Catalogues on additional production equipment also available on request.



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For more information fill in page number on Inquiry Card, on page 255

MACHINERY, April, 1957-69

We know a
GOLF CLUB maker
who used his head...
by converting to



LAPDINTE -BROACHING

he out-played his competition and copped the championship!

He was in a trap. Not really stymied, you understand, but he needed help. And he wasn't a duffer, either — not by a long shot! Actually, one of the best in the business.

But he needed a lift, and he needed distance. Well, you know how it is in golf: you change your grip, you change your swing, you change your stance, you change your clubs. When he finally changed his clubs — bis tools — and converted to Lapointe-Broaching from his former process . . . he got both lift and distance! The lift was the amazing rise in rate of production; the distance was the extra "carry" bis shop obtained in flattening out bis costs.

By Lapointe-Broaching his irons, he can now offer the golfer absolute uniformity—truly matched sets based on a scientific and exact mathematical formula of weight coordination that makes every club in the set swing and feel the same.

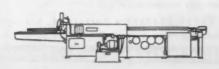
Lapointe-Broaching can help improve the production score in your own plant. Why not follow through on this, and ask a Lapointe Field Engineer to show you how Lapointe-Broaching can give you a birdie—or maybe an eagle!

THE LAPOINTE MACHINE TOOL COMPANY

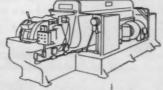
HUDSON, MASSACHUSETTS . U.S.A. In England: Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

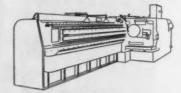
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES available only at LAPOINTE



60" STROKE HORIZONTAL ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL ELECTRIC

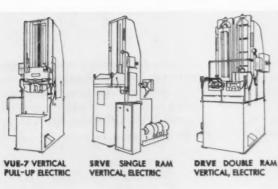


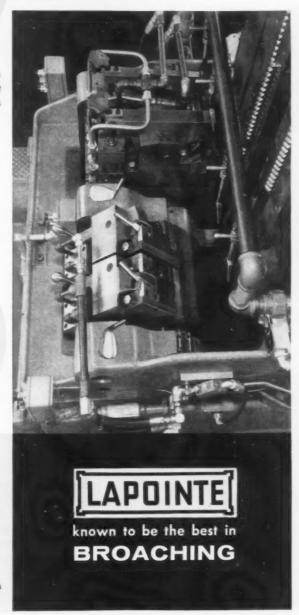
From steel forgings: the face and sole are broached on the first ram, utilizing stations #1 and #2; stations #3 and #4 at the second ram being used for the two non-parallel cuts on the back.

Broaching four surfaces on each head, at the rate of 90 complete parts per hour — one every 40 seconds (at 80% efficiency) - this LAPOINTE 10-ton, 66-inch stroke Double Ram Vertical Broaching Machine is setting new production records on golf club heads. Lapointe-Broaching produces a finish of such quality, that it requires minimum time for polishing. Machine is equipped with the Lapointe-patented Tip-Down Table, and hydraulic clamping.

Looking down on the Lapointe-built fixture, designed for those hard-to-hold parts. Interchangeable adaptors and clamp toes permit broaching all heads - No. 2 through No. 9 — with interchangeable broach assemblies, for differences in contour.

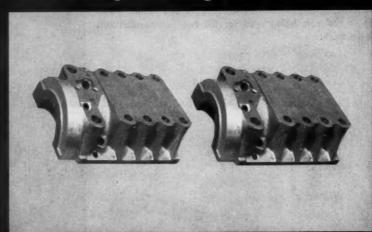






THREE NEW DEVELOPMENTS Increase Production

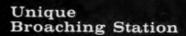
2-at-a-time processing



300 HP Natco greatly increases production by processing two complete sets of bearing caps at once.

Bearing caps—240 sets per hour—six times the production rate of the machine replaced! This new Natco processes two complete sets at once. It loads surface-broached castings automatically, performs 80 machining operations, places matched sets of finished bearing caps on the assembly conveyor. In addition to broaching and sawing, this 300 HP, 27-station Natco, drills, reams taps, turns, mills, probes and faces.

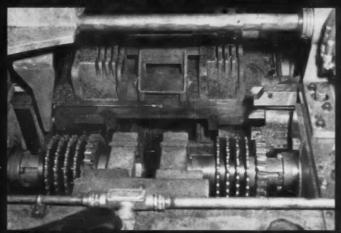
help this Natco





Fully automatic broaching station eliminates need for withdrawing broaching tools after cut. Broaching tools are pulled completely through hole, removing 030° stock.

New Rigid Saw Station



80 HP sawing station cuts two castings into complete sets of 5 caps each. All surfaces parallel within .0015°. Fixture feeds castings into stationary mounted saws, providing rigidity for accurate 14 ipm cutting.

Whatever your high production problem, our engineers will work closely with your people to develop exactly the method and the machine to do your job best. Besides special way-type, index and transfer machines, Natco also builds multiple drilling, boring, facing and tapping machines. Call your nearest Natco office in Chicago, Detroit, Buffalo, New York, Boston, Philadelphia, Cleveland and Los Angeles. Distributors in other cities.

Partners in Production



NATIONAL AUTOMATIC TOOL COMPANY, INC. Richmond, Ind.

Ask for information about the PAYD
(Pay-As-You-Depreciate) Finance Plan

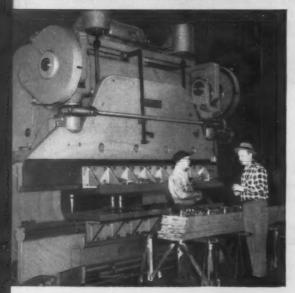
Punching and forming on accurate Cincinnati Press Brakes

... at NEW HOLLAND MACHINE CO., New Holland, Pa.



Tool boxes for New Holland Balers are shown being formed on this 8', 90 ton Cincinnati Press Brake.

A setup for punching is shown being made on this 10' 335 ton capacity Cincinnati Press Brake.



Three Cincinnati Press Brakes are profitable producers in this finely equipped plant. Some of the standard features which contribute to the accuracy of these versatile machines are:

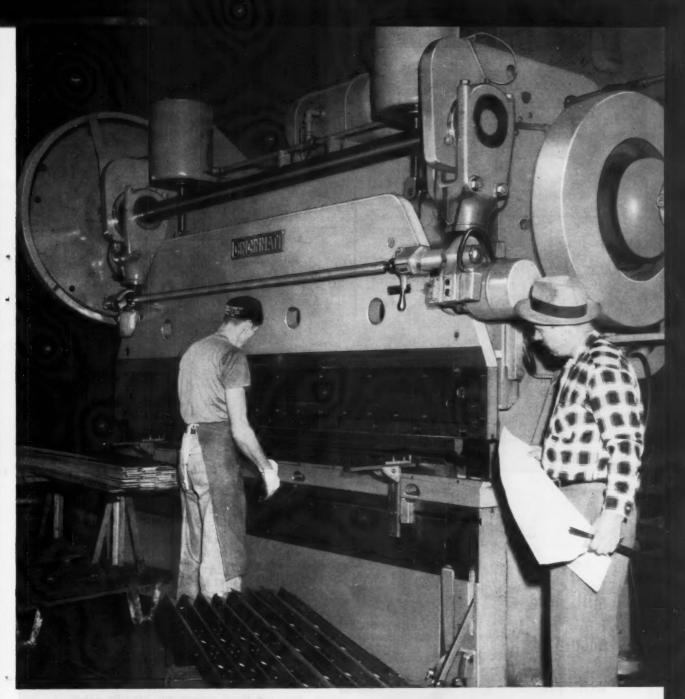
- All-steel interlocked construction (no welds used as load supports).
- Rigid, deep beds and rams insure accurate, uniform performance.
- Centerline loading eliminates weaving of frame and cramping of slides and guides.
- Tilting ram adjustment is useful for fadeout work—micrometer indicators make it easy to reset ram parallel to bed.
- Automatic pressure lubrication system insures proper oiling.

Write Department D for Catalog B-4R, and consult our Application Engineering Department about your production problems.



This Hayliner 68 Baler is just one of the many fine New Holland products made with the aid of Cincinnati Press Brakes.





This 10' Cincinnati Press Brake has a capacity of 150 tons, and is shown forming frame angles from $\frac{3}{18}$ " steel.

Photos courtesy of New Holland Machine Co., New Holland, Pa.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A.

SHAPERS . SHEARS . BRAKES



BALANCED RIGIDITY

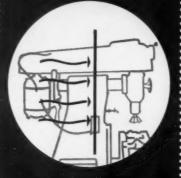


Motor mounted behind column

balances weight of head, minimizes

deflection.

ISOLATION OF MOTOR VIBRATION



Column acts as baffle, keeping motor vibration away from head.

MORE EFFICIENT POWER TRANSMISSION



Wide belt spacing permits use of B-section V-belt, more wrap-around on pulleys.

mill more accurately with the

U.S. Vertical MILLING MACHINE

The exclusive motor mount design of the U.S. Vertical provides balance, rigidity and greater milling ACCURACY! And, check these ADDED features — all designed to aid in close tolerance work.

- · Machine weighs 2000 lbs.
- Massive knee, saddle and table
- · Extra wide bearing surfaces
- Tested and CERTIFIED ten ways
- Major castings are internally ribbed, normalized and stress relieved.
- Dovetails are deep and hand scraped
- · Extra quill, knee, saddle and table travel

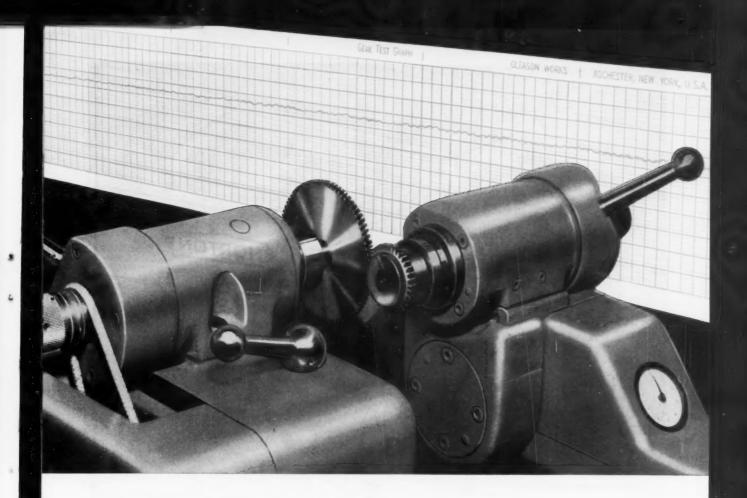
Write for your FREE copy of new U.S. Vertical Milling Machine Bulletin.

Builders of Milling Machines only

U*S*Burke

MACHINE TOOL DIVISION

17 Brotherton Road . Cincinnati 27, Ohio



Make a complete test and record of your small spur and helical gears

You can be certain that your spur and helical gears will operate correctly in their final mountings if you give them a complete test *before* actual assembly.

The new Gleason No. 104 Spur Gear Tester gives you a complete check of your gears. A rolling test for composite error provides a quantitative check of tooth spacing, profile shape and runout.

In this test, the gears are slowly rotated while a calibrated spring load keeps them in metal-to-metal contact. Any error in the gears results in a horizontal movement of the drive spindle. A completely electronic pickup and recorder make a *permanent* chart of the results.

But there is still another test you can make with the No. 104 Tester—a running test, which simulates actual operating conditions, determines the smoothness of operation, noise characteristics, and tooth contact, which will actually be obtained when the gears are used.

This machine tests precision and commercial gears up to $4\frac{1}{2}$ " center distance.

We will gladly furnish further information on the No. 104 Spur Gear Tester. Write for our bulletins.



The No. 104 Tester is furnished complete with an electronic pickup and recorder unit, as shown above.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years 1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.



Here's your SUPER-MARKET for tool room grinding wheels

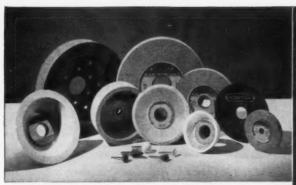
Norton makes wheels for every tool room job... precision-built for "TOUCH OF GOLD" uniformity

"Everything under one roof."

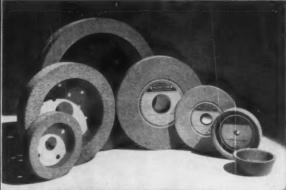
That's the modern super-market advantage Norton brings to your tool room grinding operations.

In the Norton line — the world's largest — you'll

find a type and size of wheel, in just the right abrasive and bond, for best results on every tool room grinding job you do.



NORTON G BOND AND BE BOND WHEELS bring you the most efficient vitrified bonds ever developed for precision and semi-precision grinding. For sharpening and for surface, cylindrical and internal grinding on all steels and cast alloys use G Bond or BE Bond Wheels in either 32 ALUNDUM*, 38 ALUNDUM, 19 ALUNDUM, or the new non-premium priced 44 ALUNDUM abrasive.



NORTON K BOND WHEELS in CRYSTOLON* abrasive are the best investment for many carbide grinding jobs. The vitrified K Bond comes in half-grade increments of hardness, enabling you to "pin-point" your specifications. K Bond CRYSTOLON wheels are also excellent for grinding cast iron and other low tensile strength materials.



NORTON DIAMOND WHEELS are the recognized "Crown Jewels" for carbide grinding — backed by long leadership in diamond wheel development and manufacture. For wet grinding carbide tools use them in the regular B resinoid bond — for dry grinding the B6 resinoid bond is recommended.



TWO BOOKLETS THAT TELL YOU ALL. The Handbook on Tool Room Grinding is over 200 pages long and crammed with information that will be helpful to you. How To Select Wheels For Precision Grinding Tool And Constructional Steels shows the way to correct wheel selection. Get these from your Norton Distributor or write to the nearest District Office of Norton Company, Worcester 6, Massachusetts.

Top performance is the common denominator

Norton wheels, all of them, are made on the most advanced equipment and with the most experienced "know-how" in abrasives manufacture. The result is processing so precise that it can't miss — it brings you new standards of wheel balance and duplication of grinding action.

To you, this means wheel after wheel and lot after lot will grind alike — with the same time-and-money-saving "Touch of Gold" performance.

As a manufacturer of grinding machines as well as grinding wheels, Norton knows how to build wheels exactly to machine requirements — and offers you the longest experience in both to help you produce more at lower cost. For aid in wheel selection, and for helpful booklets on tool room operations, see your Norton Distributor. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. Behr-Manning Company, Troy, N. Y. division of Norton Company. Export: Norton Behr-Manning Overseas Incorporated. For the booklets or other information write to Norton Company, Worcester 6, Mass.



Making better products ... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels
Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening
Stones • Behr-cat Tapes

W-1759

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries



Talide Die cuts molding cost 7¹/₄¢ to 1¢...

 Simonds Abrasive Company, a leading producer of abrasive wheels, called in a Talide Die Engineer to help reduce excessive die costs. The highly abrasive action experienced in molding the wheels to shape cut service life of hardened steel dies to 3000 wheels. A Talide carbide die having 6" I.D. was designed and, due to its super hard and dense structure, approximately 25 times the number of wheels were pressed! \$4,708.80 worth of steel dies would have been required to equal the production of this one \$690.00 Talide die. Metal Carbides Corporation, 6001 Southern Boulevard, Youngstown 12, Ohio.

Metal Carbides Corporation 107 E. Indianola Ave. Youngstown 7, Ohio

ATT: Mr. R.T. Beeghly

At the request of your Mr. J.R. Macek, I am forwarding information about our molding die costs for the manufacture of grinding wheels pressed on an automatic press. Dear Mr. Beeghly:

when we first began to use automatic presses in our process we set up with steel dies which gave us molding process we set up with steel dies which gave us went to die cost of \$.072 per piece a per piece die now metal carbides dies which gave a per piece die nave given process we set up with the produced.

Metal Carbides dies which gave a different grade have given process process of \$.015.

a per piece die cost of \$.015.

We have recently had one of these dies reworked and have noted still further increase in life and a per piece die cost of \$.0106. Needless to say, we are quite pleased with the results obtained. If we can produce further information, please let us know.

SIMONDS ABRASIVE COMPANY

William John William Kohn Tool Engineer

DEEP DRAW DIES

25,680,000 outlet boxes drawn with TALIDE—Steel dies average 700,000.



POWDERED METALLURGY DIES

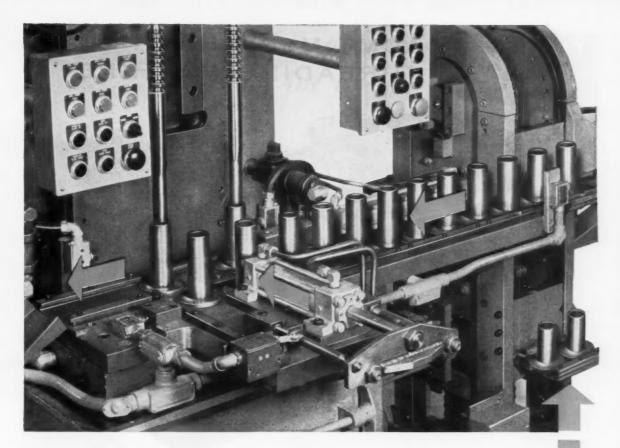
Compacting highly abrasive chemical powders, TALIDE Pill dies last 4 months, steel dies were out in 6 hours.

HEADING AND EXTRUSION DIES

Cold-heading 1/4" C-1008 steel rivets, TALIDE dies coloriectes. TALIDE dies steel rivets, TALIDE dies produced 11,200,000 pieces, other carbide dies only 3,500,000. Send for Catalog 56-G or ask for Talide Die Engineer to call



HOT PRESSED AND SINTERED CARBIDES . VACUUM METALS HEAVY METAL . ALUMINUM OXIDE . HI-TEMP. ALLOYS OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY



STANDARD Broaching Machine Tooled for AUTOMATION

This broaching setup on a Detroit 15-ton, 42-inch Vertical Pull Down Machine illustrates *practical* automation! It combines the economy of a standard machine, readily retooled for production changes, with a special work handling system that makes floor-to-floor operation fully automatic.

Flanged work pieces are loaded at floor level, conveyed to an elevator, raised, pushed off and shuttled into broaching position, broached and unloaded . . . all without an operator. Each broaching stroke sizes the I.D. and removes excess welding at the flange joint. Parts are handled as fast as they can be supplied by the "automatics" ahead of this operation.

The same broaching specialists who created this productive combination of "standard and special" can help solve *your* production problem. Send parts, prints or details now.

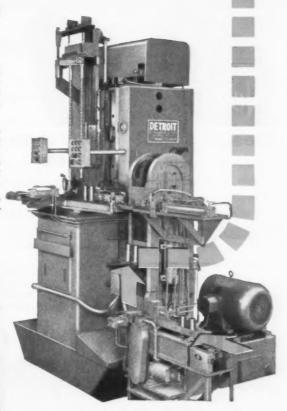
Write for bulletin describing Detroit Vertical Pull Down Machines.

DETROIT BROACH & MACHINE COMPANY

DEPT. 34

ROCHESTER, MICHIGAN

For more information fill in page number on Inquiry Card, on page 255



MACHINERY, April, 1957-81

The Newest

ACME Model HA THREADING MACHINE



Wide Speed Range: The Acme Model HA has eight spindle speeds assuring correct speeds for various diameters and materials to be threaded.

Adjustable Carriage: Adjustable both horizontally and vertically to permit alignment with the die head. Hardened and Ground Ways: Rectangular ways guide and support the carriage insuring precision alignment and smooth carriage travel.

Ask for bulletin HAT giving description and complete specifications.

The Acme Model HA is adaptable to either tangential or hob type die heads using tangential or hob type chasers of standard design. Model HA Threaders are built in 1", 11/2", 2" and 21/2" capacities in single or double spindle design.

THE HILL ACME COMPANY

ACME MACHINERY DIVISION • 1209 W. 65th St., Cleveland 2, Ohio

"ACME" FORGING • THREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" GRINDING & POLISHING MACHINES
HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

82-MACHINERY, April, 1957

For more information fill in page number on Inquiry Card, on page 255

"At York we have been using the MAPI formula as an economic tool for the past 5 years!"

J. G. BERGDOLL, JR., GENERAL WORKS MGR., INDUSTRIAL DIVISION, YORK DIVISION BORG-WARNER



"The upward spiral of wage and resulting material costs will continue to be a major factor in controlling company policies regarding investment in labor-saving equipment and procedures.

"With prices of labor-saving equipment rising with wages, it becomes doubly important to very carefully and accurately analyze each and every Capital, Project, and Expense expenditure, so that all monies so spent will result in the best possible return on the investment.

"At York we have been using the MAPI formula as an economic tool for such analyses for the past five years. With the exception of the cases where the money will be obviously returned in three years or less, we always apply the MAPI formula to analyze the situation. It is applicable not only to the study of capital purchases but also to any type of procedure or plant rearrangement change, where the cost of the change and the savings due to the change can be satisfactorily estimated.

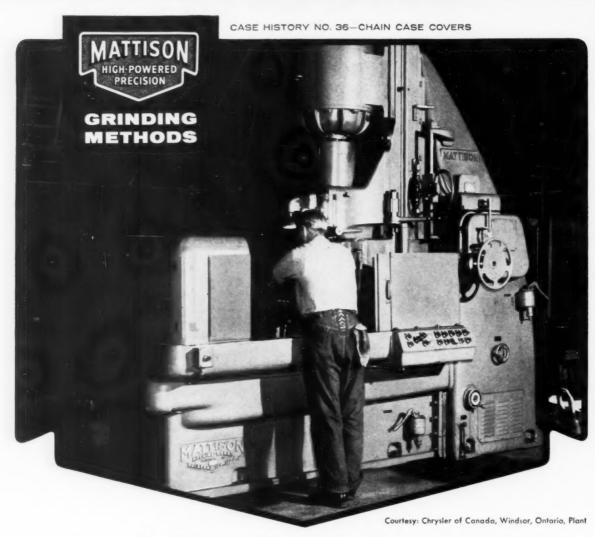
"Competition today is more intense than ever and it will not get less so.

"The company that does not continually work at cost reduction in general, and particularly at labor reduction through the adoption of improved tools, methods, and procedures, thereby reducing personnel cost per unit of manufacture, will find itself slipping backwards. In all our analyses we do not forget the sizeable fringe costs eliminated when personnel cost per unit is calculated.

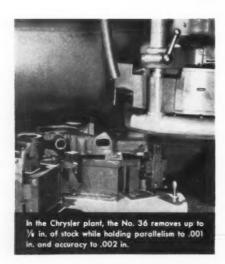
"Ready acceptance of new and improved equipment and procedures is the backbone of our industrial advancement now and in the future."

ROCKFORD V
INSERT V
GROUP

Keep gathering metal-working production ideas...be well informed when you replace machinery



Three different surfaces on chain case covers ground at 13 per hour



Power and rigidity of the Mattison No. 36 Vertical Rotary Surface Grinder pay off on this heavy stock-removal job at Chrysler of Canada's new Windsor, Ontario, motor plant. Three faces of heavy cast iron chain cases are ground in one setup... achieving a production rate of 13 cases per hour, each ground on three different surfaces.

The table passes the cases under the wheel at the rate of 30 rpm. Wheel speed is 900 rpm and downfeed is .060 in. per minute. Automatic sizer checks

each piece as it leaves the wheel and corrects feed accordingly.

3

Quality was one of the deciding factors in the selection of machinery for the new Chrysler plant. Like many other manufacturers, Chrysler has found the No. 36 Vertical Rotary's integral column-and-base construction, extra power, and exclusive functional design enable it to use modern, improved grinding wheels effectively... and profitably. For full details ask for Bulletin No. 146-4RM.

IF IT'S A FLAT SURFACE THERE IS A MATTISON TO GRIND IT



Machinery, April, 1957



MACHINES DESIGNED TO MEET YOUR NEEDS ROCKFORD, ILLINOIS, U.S.A.



Bigger loads, faster setup on surface grinder doubles production of parts formerly milled!

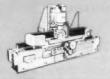
Production was boosted from 5 to 12 parts per hour by switching this job to a Mattison No. "400-SS" Vertical Spindle Reciprocating Table Surface Grinder. The workpiece is a diesel engine timing gear housing that is first rough-ground to within .010 inch on both sides and then finish-ground on the same machine. Flatness and dimensional tolerances are easily maintained within commercial limits.

Practical elimination of setup time is a big item in getting this increased production. Most parts have only to be laid flat on the magnetic table, fixtures are not needed in most cases. Seven castings, like those shown, can be finished at one time.

An extra-long and heavy column, rigidly fastened to the base, and a 60, 75, or 100 hp spindle motor are features which speed metal removal and increase accuracy on the Mattison 400 Series Vertical Spindle Surface Grinder. Arrange for a test grind on your parts in the Mattison Methods Laboratory.







PRECISION SURFACE GRINDERS

Machinery, April, 1957

CITY OF MACHINE-TOOL SPECIALISTS ROCKFORD, ILLINOIS, U.S.A.





coolant separator increases production 15%

pays for itself in less than 9 months

Automatically separating ferrous particles from coolant with a #2 BarnesdriL Magnetic Separator and recirculating it, has produced a saving of \$20.00 per week* on this cylindrical semi-automatic grinder.

A

2

Benefits such as improved finish, less downtime and less coolant waste were immediately noticeable.

Additional benefits, such as the reduction of dermatitis and increased operator comfort, were noted only after the coolant separator was in operation some time.

These benefits are typical of the savings and benefits accrued when a BarnesdriL separator is installed. Call your BarnesdriL Factory Representative today or write for Catalog 350.

SAVINGS PER WEEK:

13% hrs Cleaning Time
3% hrs Operator's Time
1.87 gals. Coolant
25% Wheel Life

FILTRATION DIVISION



BARNES DRILL CO.

820 CHESTNUT STREET • ROCKFORD, ILLINOIS DETROIT OFFICE: 3419 South Telegraph Road



Machinery, April, 1957

MACHINES DESIGNED TO MEET YOUR NEEDS ROCKFORD, ILLINOIS, U.S.A.

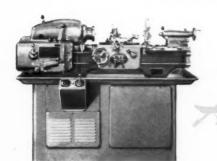
More features per dollar than any other lathe in its class!

9" tool and gage-makers' lathe



High-speed, precision machining like the job above is backed up by Hendey features like precision, antifriction bearings at both ends of spindle (upper right), and quickchange gearbox (lower right) for 66 changes of threads.

Infinitely adjustable spindle speeds from 15 to 3000 rpm — adequate speed for best results with carbide tools - both are yours with the magnetic amplifier drive on the Hendey 9 in. x 24 in. toolmakers' lathe. Geared feeds are from .002 in. to .120 in. per revolution of the spindle while belt-driven feeds range from .001 in. to .060 in. Every detail is designed for toolroom accuracy and long, trouble-free operation — yet the cost is below that of conventional machines. Ask your Hendey dealer about complete facts and features!



for precision with production, buy Fendey

42 Loomis St., Rockford, Illinois

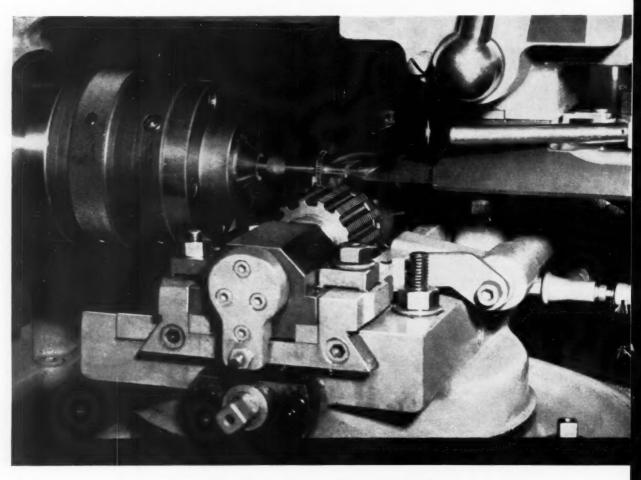


Machinery, April, 1957



HOBBING PRECISION GEARS

within precision Class 2 AGMA tolerances....



Fine-pitch instrument gears are cut on Barber-Colman Precision No. 6-10 Hobbing Machines at Belock Instrument Corporation. For their most accurate gears, Belock uses Barber-Colman Class AA hobs exclusively.



with standard-type precision hobbing machines

The Belock Instrument Corporation manufactures complex electronic and electromechanical systems and components. The constant demand placed on them for greater accuracy in these instruments requires all gears to be cut to very close tolerances and yet be completed on a practical production basis.

Belock hobs such gears consistently within Precision Class 2 AGMA tolerances, using a battery of standard-type Barber-Colman Precision No. 6-10 hobbing machines. These are unusually close tolerances and the use of standard-type machines for these gear accuracies is a good reason for taking a close look at the elements and methods they employ.

here's how they do it:

Gear blanks are machined to Precision AGMA tolerances. Then, for maximum accuracy in hobbing all precision gears, Barber-Colman Class AA single-thread ground hobs are used. These hobs are manufactured with tapered bores, since taper-bore hobs can, with greater ease, be mounted more accurately on the hob arbor to eliminate runout. These hobs are resharpened to original class AA accuracy using a Barber-Colman No. 6-5 Hob Sharpening Machine.

The gears are finish-hobbed on Barber-Colman Precision No. 6-10 Hobbing Machines. These machines hold a precision relationship between the rotation of the work and the rotation of the hob which allows them to consistently hob gears to these fine tolerances.

Barber-Colman Precision No. 6-10 Hobbing Machines are built with large precision index worm gears and single-thread worms for maximum tooth spacing accuracy. All vital machine parts are specially selected for close tolerances.

If you have a problem of producing consistent accuracy in gear cutting, consult Barber-Colman Hobbing Engineers for assistance. They can help you obtain any class of accuracy you desire with the most practical equipment for doing it.



this is an actual production record:

GEAR

Diametrical Pitch — 64 Pressure Angle — 20 Outside Diameter — .7812" Pitch Diameter — .7500" Face Width — .093" Material — 303 Stainless, 30-35 RC

HOE

Class AA Ultra-Precision 2" Diameter, Taper Bore Pieces per Sharpening — 720

Stock Removal per Sharpening — .005"

OPERATION

Feed — .015 / rev. Speed — 120 sfm

BARBER-COLMAN COMPANY

724 ROCK STREET . ROCKFORD, ILLINOIS

Hobs · Cutters · Reamers · Hobbing Machines · Hob Sharpening Machines



Machinery, April, 1957



Improve milling methods and Rigidmils and



Determining the most profitable processing method, then selecting the machines to suit this method that's Sundstrand

"Engineered Production"

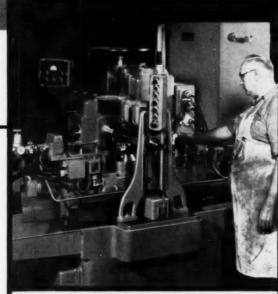
at work.

A high percentage of milling problems are solved with standard or semi-standard machines but, when necessary, entirely special machines will be designed and built. The important fact is: Sundstrand designs and builds all three types of machines, assuring you of always getting the best machine for your part design and production requirements.

These three examples illustrate the application of Sundstrand "Engineered Production" to three milling problems using: (1) a standard Rigidmil, (2) a semi-standard Rigidmil (standard machine equipped with special or multiple-spindle head), and (3) special Rigidmils. Whether your milling job is similar to any of these shown, or the part differs completely in geometry and size, the broad processing experience of Sundstrand engineers enables them to offer the most practical method for your job. Ask for a Sundstrand "Engineered Production" analysis of your milling job. There is no obligation for this service.

ADDITIONAL DATA on "Engineered Milling Production" is available in Bulletin No. 678. Write for your copy today.









Milling Aluminum Forgings on a Standard Rigidmil

A Sundstrand Model 22 Rigidmil with standard equipment arbor mills six lugs on aluminum forgings, two in each cut of an automatic cycle that includes indexing of the work. The two-way feed table mounts a three-division index base and workholding fixture at each end, enabling operator to unload and load one fixture while the other is in cutting position. Production is 113 parts per hour.

AUTOMATIC LATURE . SIMPLEY DICIDALIS . DUDLEY DICIDALIS



"Engineered Production" Service*





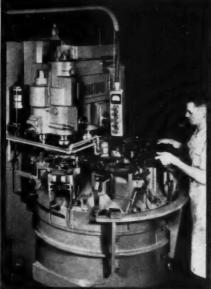




Machinery, April, 1957

MACHINES DESIGNED TO MEET YOUR NEEDS ROCKFORD, ILLINOIS, U.S.A.

cut costs with Sundstrand "Engineered Production" service!









Mills at Two Depths

Simultaneously A Vertical Rotary Rigidmil equipped with special three-spindle head ruffs and finishes the large pad on this casting and, in addition, takes one cut on the small pad at a different depth. Unusual part configurations like this one shown are among the processing problems that can be overcome with semi-standard Rigidmils.

Semi-Standard Rigidmil Multiple Surfaces Milled and Drilled on a

Special Rigidmil The milling and drilling of port faces and bottom pads on 43 automotive manifolds per hour is performed on this multi-spindle special Rigidmil. One vertical and two angular spindles are mounted in the head bridging the table at the front. A 4 spindle vertical drill head is mounted between two 6 spindle angular drill heads at the rear. Machining operations are performed during both the forward and reverse feed strokes of the table.

TRIPLEX RIGIDMILS

SPECIAL MACHINES





SUNDSTRAND Machine Tool Co.

2530 Eleventh St. . Rockford, III., U.S.A.

Machinery, April, 1957



SIX AND FOUR-SPINDLE AUTOMATIC BAR MACHINES

GREENLEE Special Machine Tools

- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Hydro-Borer Precision Boring Machines

You hear much comment about Greenlees' uninterrupted, round-the-clock performance in widely different industries. With good reason, too, for Greenlee offers years of manufacturing experience... plus manufacturing integrity not often duplicated.

Want complete information? Call in the Greenlee man. Let him give you the complete story. Please submit a print when inquiring about a specific job.

WRITE FOR CATALOG No. A-405

GREENLEE BROS. & CO.

1864 MASON AVENUE ROCKFORD, ILLINOIS



Machinery, April, 1957

CENTER OF MACHINE-TOOL EXCELLENCE ROCKFORD, ILLINOIS, U.S.A.

alone

THE RHYTHM OF

graphically depicting

AUTOMATIC MASS PRODUCTION TECHNIQUES

This book stands ALONE!

It presents techniques of mass production which are completely changing present concepts of manufacturing.

The principles of Barnes hydraulic controls and actuations as illustrated in this text

... are destined to improve living conditions for every man, woman, and child,

. . . will guide manufacturing techniques to unbelievable productive results,

... point the road to a better way of life, far in advance of current thinking.

YOUR COPY IS READY! Request it on your company letterhead. This is the first edition.

Act now!

ALSO AVAILABLE — A full color 16mm. film,
"The Rhythm of Production," which vividly
illustrates the automatic techniques presented
in the book. Write and reserve a date for this movie.



LANGE SERVICE AND ADDRESS OF THE PARTY OF



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FINORE ACTION



JOHN S. BARNES CORPORA

OI SOUTH WATER STREET ROCKFORD, ILLINOI

Copyright, 1957, John S. Barnes Corporation

Machinery, April, 1957



"Engineered Production" Service



It takes all 5

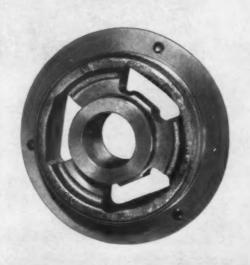
AMERICAN'S "ENGINEERED PRODUCTION" SERVICE ... gives the broach-user the complete three-part service that is essential to obtain the most practical broaching method. Years of design and production engineering experience, unavailable at any price, are effectively added to your staff at no extra cost.

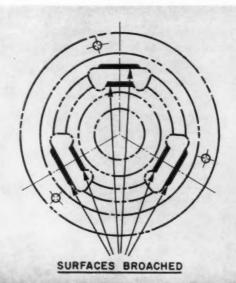
THE JOB — Broaching the flats and chamfer in the three slots of a differential center wheel. Moderate production rate required.

THE RESULT—40 completed parts per hour (a total of 120 slots) broached on a hydraulic horizontal machine. Part is indexed while broach is being returned to starting position for the next cutting stroke.

PROPER BROACH TOOL DESIGN

Top-quality results on any broaching operation require starting the job with design of the broaching tool itself. In solving this all-important first step, American Broach considers stock removal, length and width of cut, finish, tolerances required, etc. American's experience in designing and building broaches for every type of part capable of being broached pays off in quality of work and in long tool life. You can be sure the broach and machine will operate as a team because they are designed that way.

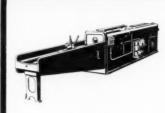












Horizontal

ay Single



Machinery, April, 1957

CENTER OF MACHINE-TOOL EXCELLENCE ROCKFORD, ILLINOIS, U.S.A.



SPECIFYING THE RIGHT MACHINE

Production rate required, length and speed of stroke, relationship to other production machinery, and available floor space determine the selection of the broaching machine capable of doing the best job. At American, machine selection follows design of the broaching tool. Because American builds a complete line of standard machines and has extensive experience with specials, you can depend on getting the most practical machine for your job.





Whatever your part geometry or hourly needs, fixturing by American Broach forms the vital third link in the production chain. Whether manual loading and unloading is used or the work cycle is completely automatic, work-holding fixtures designed and built by American Broach feature easy loading and unloading coupled with positive clamping during the broaching cycle. Even with relatively inexperienced operators, production schedules are maintained since the "skills" are built into

the tool, machine, and fixtures. For more information on practical broaching methods write for Bulletin A613.





SUNDSTRAND BROACH & MACHINE DIVISION

SUNDSTRAND MACHINE TOOL COMPANY ROCKFORD, ILLINOIS

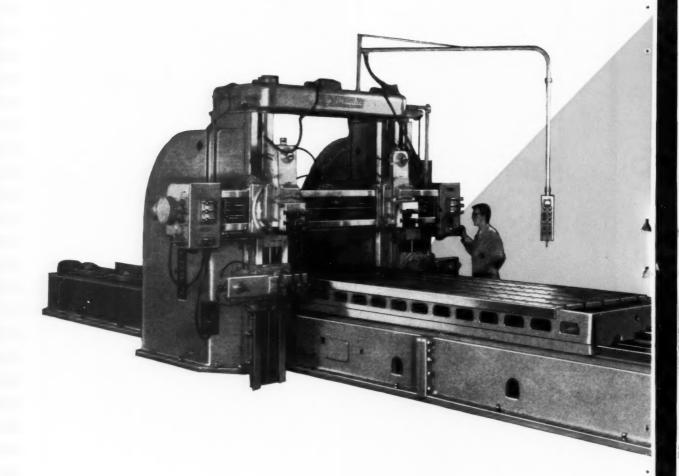
Machinery, April, 1957

CITY OF MACHINE-TOOL SPECIALISTS ROCKFORD, ILLINOIS, U.S.A.



versatility of triple circuit h3 drive







Machinery, April, 1957

MACHINES DESIGNED TO MEET YOUR NEEDS ROCKFORD, ILLINOIS, U.S.A.

shown with 4-TON work piece!

MACHINED ON DOUBLE-HOUSING

ROCKFORD HYDRAULIC PLANER

A Rockford Double-Housing Hydraulic Planer machines this huge casting, using carbide tools on 2 railheads and 1 sidehead.

The exclusive hydraulic triple circuit supplies 3 cutting speed ranges for flexibility in changing from one kind of work to another. Pendant control offers selection of low range to 100 fpm., for extreme depths of cut and maximum feeds; medium range to 150 fpm., for average cuts in medium steel or cast-iron; or high range to 300 fpm., for carbide planing of steel and non-ferrous metals.

It is possible for an operator to adjust the h3 drive from 10 to 300 fpm. at the normal operating position, instantly selecting the speed range ideally suited for his individual job application.

See your Rockford Machine Tool Company representative for complete information on the versatility of the new hydraulic triple circuit h3 drive for your production work.



ROCKFORD MACHINE TOOL CO.

2500 KISHWAUKEE STREET . ROCKFORD, ILLINOIS

Machinery, April, 1957

CITY OF MACHINE-TOOL SPECIALISTS ROCKFORD, ILLINOIS, U.S.A.





So Many Products from These Husky Steel Blanks

If some of your products require the use of circular steel parts, then Bethlehem's forged-and-rolled blanks should be of unusual interest to you. For Bethlehem makes blanks by a method that forges and rolls the steel in a single operation, thus insuring uniform density, excellent grain flow, and very high strength. It is a process unduplicated by any other manufacturer.

For many years customers have used these strong steel blanks in making gears, crane wheels, end rings, sheave wheels, turbine rotors, flywheels, tire molds and rings, pistons, clutch drums, and similar parts. Because of the high strength inherent in the blanks, it is often feasible to employ thinner-than-usual sections. This means a saving in weight. And machining can be done so dependably that there is almost never a reject.

Bethlehem blanks come in a wide range of sizes—approximately 10 to 46 in. OD. They can be furnished heat-treated or untreated. And they are competitive pricewise, so that you can use them without increasing your costs.

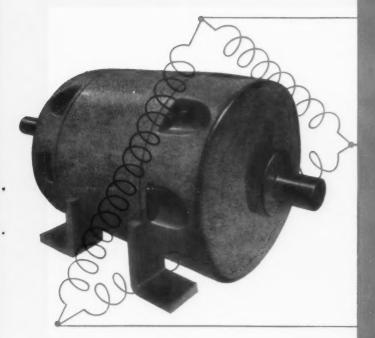
Full details will be furnished by the Bethlehem office nearest you. Write for complete information.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL





SIMPLE DEPENDABLE protection against phase failure and phase reversal

A-B protector

opens control circuit in 3 to 4 cycles...under all load conditions

When men, motors, or the driven machines can be "hurt" by "phase failure" or "phase reversal" . . . the new Allen-Bradley Bulletin 812 should be used as a low cost and reliable "safety" insurance. It detects phase failures and reversals electrically, and within not more than 3 or 4 cycles, opens the motor control circuit—regardless of motor load (including no load)—and thus stops the motor.

The Bulletin 812 Type A relay protects motors against all phase failures. The Type B relay protects motors against loss of a phase and reversed phase rotation. For the first time, dependable protection is provided for motors supplied by Wye-Delta and Delta-Wye power systems having the neutral ungrounded or not connected to the circuit.

Bulletin 812 relays offer positive protection against motor or machine damage due to opening a primary line—and under all "load" conditions. No field adjustment is required. Remote reset is inherent. Furthermore, as a static device which does not rely for its operation on "motor" revolution the possibility of failure to operate is eliminated.

Bulletin 812 relays are built in four sizes which will reliably protect motors with full load currents from 1.25 amperes to 300 amperes. Let us send you more information about this dependable answer to phase failure and phase reversal problems.





Bulletin 812 Type A phase failure relay protects a 3-phase motor against loss of a phase.

Bulletin 812 Type B phase failure and phase reversal relay protects a 3-phase motor against both loss of a phase and phase reversal.

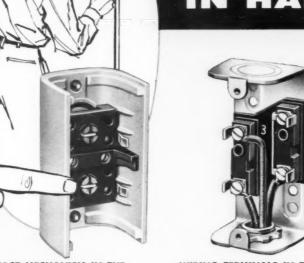


Allen-Bradley Co. 1316 S. Second St. Milwaukee 4, Wis.



In Canada— Allen-Bradley Canada Ltd. Galt, Ontario new Allen-Bradley Bulletin 800 Standard-duty Push Buttons

CAN BE WIRED IN HALF THE TIME!



CONTACT MECHANISM IN THE COVER-COMPLETELY PROTECTED FROM CARELESS SCREWDRIVERS AND CARELESS WIRING.



WIRING TERMINALS IN THE BASE -COMPLETELY EXPOSED FOR EASY WIRING.



Bulletin 800 standard-duty push buttons—with strong, gray, molded cover are "good-looking"and"safe" in operation. All stations have dual knockouts, top and bottom.

Here's an entirely new idea in push button stations—a wraparound cover which contains and protects the contact mechanism. Removing the cover exposes all terminals for instant and easy wiring. Heavy, silver plated contacts connect the push button assembly in the cover with the terminals in the base.

Matching ribs in the cover and notches in the molded terminal base eliminate the possibility of having wiring connections made incorrectly. A molded, bakelite shield protects the contact mechanism and prevents careless wiring from interfering with contact operation. All push button contacts are silver and of the double break construction.

Specify the new Allen-Bradley standard-duty station on your next order. Its installation time-saving feature, alone, should make you a regular customer!



4-57-MR

SELECTOR SWITCH

You can't beat this for convenience-a selector switch with the same easy-to-wire construction as the push buttons, shown above -plus the feature that you can change-in seconds-from two position to three position (or vice versa)! The correct name plate is furnished with each switch. See for yourself how easily this is accomplished.

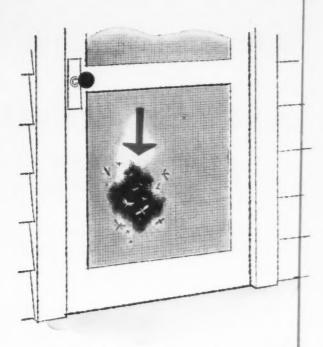
CHANGE IT FROM 2 POSITION TO 3 POSITION (or vice verse) ... in 30 Seconds!

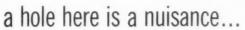


ALLEN-BRADLEY

CONTROL

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. In Canada—Allen-Bradley Canada Ltd., Galt, Ontario







a hole here is convenient

Crucible Hollow Tool Steels eliminate the nuisance of drilling, boring, cutting-off or roughfacing of ring-shaped, tubular or bored tool steel parts. They save you money, too, by reducing machine time and scrap losses.

Crucible Hollow Tool Steels are produced in all of the famous Crucible tool steel grades . . . in bars or saw cut lengths to meet your needs. And they're available in almost any combination of O.D. and I.D. sizes. You can get these five grades "off the shelf" from your local Crucible warehouse: KETOS oil-hardening . . . SANDERSON water-hardening . . . AIRDI 150 high-carbon, high-chromium . . . AIRKOOL air-hardening . . . NU DIE V hot work.

See how Crucible Hollow Tool Steel Bars will save you hours of shop time. Call your Crucible representative. Crucible Steel Company of America, The Oliver Bldg., Mellon Square, Pittsburgh 22, Pa.



first name in special purpose steels

Crucible Steel Company of America

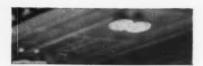
Canadian Distributor - Railway & Power Engineering Corp., Ltd.

For more information fill in page number on Inquiry Card, on page 255

MACHINERY, April, 1957-99

HOW METALWORKING GENERAL THROUGH ITS NEW

Laboratory with factory-size equipment—that's the new \$5,000,000 G-E metals and ceramics laboratory in Schenectady. From here will come many of the products manufactured by the Metallurgical Products Department of General Electric Company, 11147 E. 8 Mile Street, Detroit 32, Michigan.



BENEFITS FROM THE RESOURCES OF ELECTRIC METALLURGICAL PRODUCTS DEPARTMENT



Solutions to your most pressing problems, plus developments ahead of industry trends, are now being worked out in our laboratories

It doesn't take a crystal ball to know what role cutting tools will play in the Metalworking Industry in the future. The signs are unmistakable.

More accurate casting, extruding, and forging techniques will mean that less metal must be removed by machining. And this will mean that cutting tools must take thinner cuts, and hold closer tolerances.

New and more automatic machine tools will mean that cutting tools must operate at higher speeds — yet provide the longer tool life necessary to give you maximum benefits from automation.

General Electric, through its new Metallurgical Products Department (successor to the Carboloy Department), has already developed several cutting tool materials that are ahead of these trends.

Three years ago, the first of the three Carboloy* Series 300 carbides was announced. Today, these grades permit you to cut harder steels, at higher speeds... at lower machining cost per part.

Two years ago, General Electric

researchers introduced Cemented Oxide. This material puts mirror finishes on metal, while operating at speeds up to 3000 fpm – far beyond the range of carbides and ceramics.

And last year, G-E Engineers in the Carboloy Machinability Laboratory developed several new machining techniques to help you make better use of these improved materials. One of these techniques lead to a way to utilize carbides at low speeds — starting from 0 fpm — an almost impossible task until now.

All these developments resulted from the vast technological resources which General Electric has brought to bear on metalworking problems – plus the fund of machining knowledge accumulated since G-E first introduced carbides to American industry in 1928.

These resources and this knowledge mean that General Electric—through its Metallurgical Products Department—will be able to recognize and solve new problems of the Metalworking Industry as they arise.

Progress Is Our Most Important Product

GENERAL 🍪 ELECTRIC



compare with the standard

...in high speed steels the standard's REX

Ever since grandad's day, Crucible's REX® high speed steel has been the standard by which all other high speed steels are compared. And now the quality and uniformity of REX are even better, thanks to improved manufacturing techniques at Crucible.

Don't take our word for it. Prove for yourself how REX leads in structure, uniformity, response to heat treatment, and fine tool performance.

Ask for REX at your nearby Crucible warehouse - or order it through prompt mill shipments. And, for a list of available data on all Crucible special purpose steels, write now for a free copy of the "Crucible Publication Catalog". Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.

CRUCIBLE first name in special purpose steels

Steel Company Crucible

102-MACHINERY, April, 1957

For more information fill in page number on Inquiry Card, on page 255

AVOID the
HIGH COST
and difficulty
of fabricating
long, hard
& straight parts
by conventional
methods . . .

THOMSON

6

and ground

SHAFTS, ROLLS, GUIDE RODS and other long-round parts

60 Case is the result of over ten years of experimental work and production experience with hardened and ground shafts which are a requirement for BALL BUSHINGS, the Linear Ball Bearing manufactured by Thomson Industries, Inc.

nardened

The special techniques and equipment that have been developed enable high production rates and low handling costs. This permits big savings over conventional methods which are plagued with erratic warpage, straightening and resultant grinding problems. Finished 60 Case parts frequently cost less than the scrap losses that result from conventional methods.

60 Case material has a surface hardness close to 60 on the Rockwell C scale which is essential to resist wear.

Long lengths of material ranging in diameter from $\frac{1}{4}$ " to 4" are stocked to enable prompt shipment of 6θ Case parts, with or without special machining.

OST REDUCTION

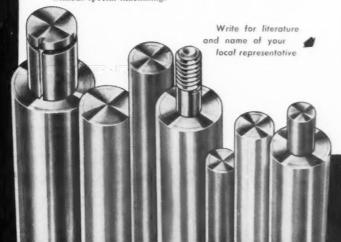
- . HARD BEARING SURFACE
- ACCURATE DIAMETERS
- GROUND FINISH
- . STRAIGHT PARTS
- . DELIVERY FROM STOCK
- ADDED STRENGTH
- . UNIFORM HIGH QUALITY

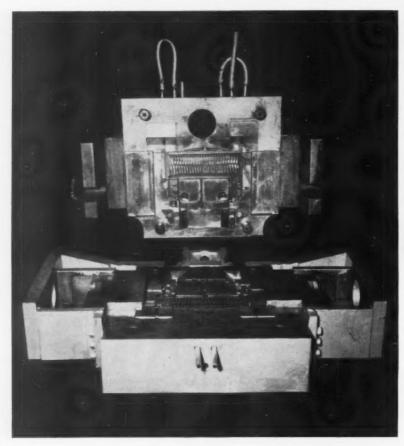
TYPICAL 60 Case PARTS

GUIDE RODS, SHAFTING, ROLLS, TRAVERSE RAILS, PISTON RODS, ARBORS, LEADER PINS, TIE RODS, KING PINS, AXLES, CONTROL RODS, GUIDE POSTS, MANDRELS, BEARING ROLLERS, SPINDLES

THOMSON INDUSTRIES. Inc.

Dept. C6, Manhasset, New York





No matter what your DIE-CASTING JOB may be...

Accuracy calls for POTOMAC M Hot Work Die Steel



Write for BLUE SHEET on POTOMAC M

This concise four-page folder gives all needed handling and shop treatment details on Potomac M. Included is certified laboratory information on physical characteristics, and complete data on forging, annealing, hardening, tempering, etc. Ask for your copy.

ADDRESS DEPT. M-88.

In the precision casting of aluminum, POTOMAC M Hot-Work Die Steel is especially favored as the material for die-casting dies because its properties help assure accuracy of the steel itse! fafter heat treatment. Die makers have found that size changes are held to a minimum. Dimensional stability is thus the first contribution that POTOMAC M makes to accuracy.

Production accuracy of the die after it is in service is maintained also by the resistance of POTOMAC M to wear, to heat checking, and to metal wash.

Allegheny Ludlum makes a complete line of steels for hot-work tooling of various kinds—so, whether your need is the mass producing of duplicate parts or fabricating a few of them, call up or write "A-L" every time for hot-work counsel or service or both. Just tell us your requirements.

• Allegheny Ludlum Steel Corporation, Henry W. Oliver Bldg., Pittsburgh 22, Pa.

For nearest representative, consult Yellow Section of your telephone book.

Allegheny Ludlum



How to speed up your automatic forging operations ...at no extra cost

To get the continuous, fast operation vital to making the most of your automatic forging production lines, you need uniformity in the steel you use. High speed heat-treating and hardening operations are often interrupted by changes in chemical composition and structure of steel used. Uniformity cuts interruptions for adjustments. It helps you gain the full advantages of automatic operation. And you get the utmost in uniformity—at no extra cost—by using Timken* electric furnace fine alloy steel. It's uniform from bar to bar, heat to heat, order to order.

We take many extra quality-control steps to insure this uniformity. Some of them were "firsts" in the steel industry. For example, a magnetic stirrer for molten steel assures equal distribution of alloys, uniform temperature and working of the slag. And the Timken Company was also first to use a direct-reading spectrometer to insure uniform grain size and chemical composition right to the instant the heat is tapped.

To further assure uniformity, your order of Timken fine alloy steel is handled individually. We target our conditioning procedures to meet your end use requirements. Each bar is stamped to identify the heat it came from. This limits variations within an order as well as from order to order.

So to step up your automatic forging operations—at no extra cost—always specify Timken fine alloy steel. You'll get uniform results, faster, continuous production, time after time. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio, Cable address: "TIMROSCO".

TIME STEEL

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING

For more information fill in page number on Inquiry Card, on page 255

MACHINERY, April, 1957-105



Chipping and Edge Breakdown Eliminated by Switching to STELLITE Alloy Tools

HAYNES STELLITE Star J-Metal tools mill an average of 220 of these cast iron differential housings per grind despite periodic contact with hard white iron spots. Chipping and edge breakdown, major problems when other tool materials were used, have been eliminated by switching to STELLITE alloy tools. As a result, unscheduled down time has been drastically cut. About 3/16 in. of stock is removed from each casting with 0.010 to 0.012 in. chip load per tooth. Cutting speed is 88 surface ft. per minute. The 40 standard Ingersoll-type blades mounted in a 12-in. cutter can be counted on for a full shift's production.

HAYNES STELLITE alloy tools are successful on applica-

tions like this one because they have good impact strength, high compressive strength, and their cutting edges remain hard and sharp even when red hot. They resist chipping and spalling in spite of severe shock. Metal removal is fast because high speeds, comparatively high feed rates, and deep cuts can be used.

For more information on efficient metal removal with HAYNES STELLITE tools, write for the booklet, "HAYNES STELLITE Metal-Cutting Tools." It gives information on chip formation, tool design, and grinding procedures.

"Haynes", "Haynes Stellite", and "Stellite" are registered trademarks of Union Carbide and Carbon Corporation.



HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

LICE

General Offices and Works, Kokomo, Indiana

Sales Offices
Chicago • Cleveland • Detroit • Houston • Los Angeles • New York • San Francisco • Tulsa



A switch to USS Free-Machining MX Steel can have some remarkable results. Your production rates will take a jump—increase up to 50% or more depending on the job... your tools will last longer, often twice as long... machine down time will be reduced... your parts will have cleaner, sharper finish... dimensional accuracy will be easier to maintain... you'll have fewer rejects.

And, because MX sells at the same price as regular screw stock grades, your production costs will be lower. Hundreds of progressive shops that have put this faster-cutting screw stock to work have proved this to be true. Based on the cost reductions they report, which average between 10 and 15% and have sometimes run as high as 42%, we feel confident that MX will cut the cost of any part you now machine from regular screw stock. The more machine work required, the greater your savings will be.

USS Free-Machining MX Steel has been successfully machined at speeds up to $350~\mathrm{SFM}$. It is produced

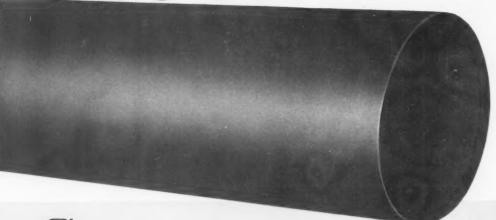
in all the popular screw stock sizes and is available in both Bessemer and Open Hearth grades. You can buy it in cold-finished form from your regular supplier, either as "MX" or under his own identifying trade name. In hot-rolled form, MX is available through our nearest sales office. Why not give it a try?

UNITED STATES STEEL CORPORATION, PITTSBURGH AMERICAN STEEL & WIRE DIVISION, CLEVELAND COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. UNITED STATES STEEL SUPPLY DIVISION WAREHOUSE DISTRIBUTORS, COAST-TO-COAST UNITED STATES STEEL EXPORT COMPANY, NEW YORK



UNITED STATES STEEL

now...



Carpenter e-x-t-e-n-d-s the

built-in safety factor
of STENTOR (oil-hard)
tool and die steel!

Remarkable heat treating versatility found in no other oil-hardening, non-deforming tool steel, now assures extra cost-savings with Carpenter STENTOR (Oil-Hard). A broader, safe hardening range from 1425° F to 1525° F makes it possible to fit STENTOR tools and dies into many heat treating schedules during the average day.

Make your own evaluation. Add this extended built-in factor of safety to the other cost-saving advantages you get with STENTOR: easy machinability, less size change and distortion, uniform hardenability and freedom from decarb. Then call your local Carpenter Mill-Branch Warehouse, Office or Distributor for information and rush delivery on STENTOR with its extended built-in factor of safety.

Carpenter -

matched tool and die steels



The Carpenter Steel Co., 105 W. Bern St., Reading, Pa.

Export Department: The Carpenter Steel Co., Port Washington, N. Y .- "CARSTEELCO"

108-MACHINERY, April, 1957

These Oakite shortcuts speed your metal cleaning

1 Cleaning and rustproofing—in one washing operation

Oakite Composition No. 98 (used cold or hot in one-stage or two-stage washing machines) removes cutting oils and chips—while it leaves a thin film that protects steel against rusting between operations or during temporary storage.

Excellent for cleaning before inspection: the metal is cool for immediate handling and the film (too thin to affect measurements) prevents finger prints from corroding highly finished surfaces.

One auto manufacturer uses No. 98 in seven plants for cleaning and rustproofing brake cylinders, camshafts, connecting rods, crankshafts, cylinder heads, flywheels, push rods, tappets, wrist pins, etc.



2 Stripping pigmented paints—with no need for pickling before repainting

Oakite Rustripper saves money in paint shops by doing a complete stripping job in one operation. It eliminates extra pickling and neutralizing to remove the metallic pigments, phosphate coatings and rust that prevent successful repainting.

A television manufacturer says "We formerly took 25 minutes to strip rejected cabinets, then had to pickle to remove tarnished phosphate coatings. Today 10 minutes in Rustripper strips the same cabinet so bright and clean you can't tell it from new. Eliminates pickle, neutralize and rinses."

An auto parts maker uses Rustripper for continuous conveyor line stripping. "Cycle of 1 minute and 50 seconds works like a charm stripping paint and incidental rust from rejects and hooks."



Cleaning, derusting and descaling—in one alkaline tank

Oakite Rustripper saves money in plating shops by removing rust or heat scale at the same time it removes oil and other soils. Alkaline pickling with Rustripper avoids hydrogen embrittlement, etching of machined surfaces and other disadvantages of acid pickling. Rustripper is also used for precleaning or electrocleaning in plating lines.

An aircraft manufacturer who formerly sand blasted to remove heat scale says "Now the scale is removed in 30 minutes in a boiling soak in Rustripper."

A job plater who adds Rustripper to his reverse-current cleaner in an automatic plating machine, says "We used to clean 45 seconds. Now 20 seconds cleans sparkling bright...saves precious time..."



E

NAME .

COMPANY.

Write for booklets OAKITE PRODUCTS, INC., 26 Rector St., New York 6, N. Y.

Send me the FREE booklets indicated below:

- 1 "For Power Washers—Oakite Composition No. 98"
- 2 "Here's the best shortcut in the field of organic finishing"
- 3 "Here's the best shortcut in the field of electroplating"

Technical Service Representatives in Principal Cities of U. S. and Canada

> Export Division Cable Address: Oakite

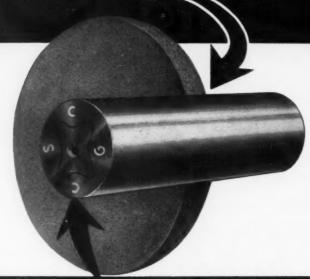


An exclusive GRINDING PROCESS...

makes

CUMBERLAND STEEL BARS

concentric, straight, smooth & really accurate



BE SURE OF THIS MARK ON THE END OF YOUR SHAFTS

CUMBERLAND GROUND BARS FOR ALL TYPES OF MACHINES

They are carefully ground to our standard manufacturing tolerance, plus nothing to minus .002" on diameters 1-1/8" to 2-7/16" inclusive . . . plus nothing to minus .003" on diameters 2-1/2" to 8" inclusive. Closer tolerance can be furnished, if desired. And, remember, Cumberland Steel Bars are the end result of 109 years' experience,—and every bar is carefully tested before shipment. The list of Cumberland's customers reads like the "Blue Book" of Industry. Ask for further information.

MANUFACTURED IN THREE SPECIFICATIONS

Cumberland Brand—AISI C-1020/C-1025, Elastic Limit 30,000# Min.
Potomac Brand—AISI C-1040, Elastic Limit 45,000# Min.
Cumsco Brand—AISI C-1141, Elastic Limit 57,000# Min.

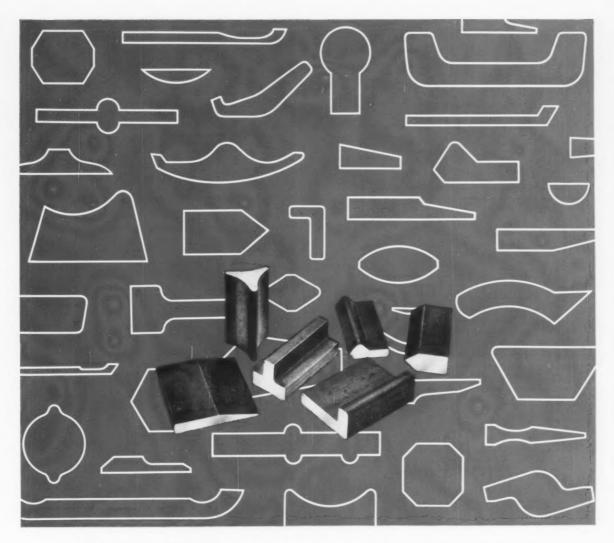
CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U.S.A.

ESTABLISHED 1845

INCORPORATED 1892

110-MACHINERY, April, 1957



Crucible special shapes

for better alloy steel parts at lower cost . . .

If you're machining intricate sections from solid bars—or using expensive forgings—stop! Choose instead, a *Crucible special shape* that approximates the finished part. *Crucible special shapes* eliminate rough-machining operations... reduce scrap losses.

There's practically no limit to the *special* shapes available at Crucible, in a wide variety of

alloy steels. Rolls for over 400 special shapes are available—other shapes can be rolled to your specifications. Your local Crucible representative can give you the whole story of how special shapes can cut costs—save time. Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.



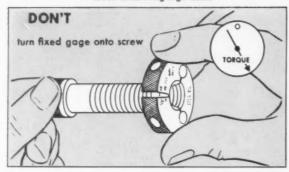
first name in special purpose steels

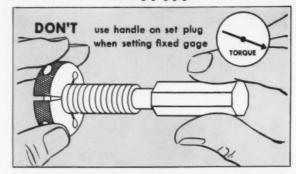
Crucible Steel Company

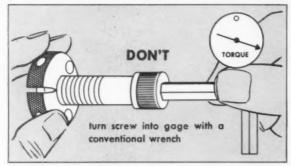
For more information fill in page number on Inquiry Card, on page 255

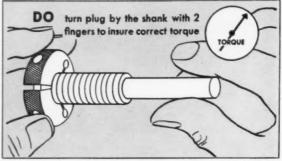
of America

MACHINERY, April, 1957-111

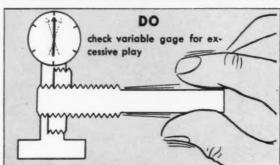












These illustrations from new SPS booklet show some of the do's and don'ts of gaging precision threads,

3A threads: what they are; how to gage them — new SPS booklet tells all

Threads made to Class 3A fit are the most precise in general use in industry. But you do not always get the 3A precision you specify. Because of many different gaging techniques that yield varying results, screws with threads well outside the Class 3A tolerance limits often pass inspection.

SPS has prepared a new booklet on this subject. It explains clearly what Class 3A threads are and the pros and cons involved in the widely varying gaging techniques in use today. It reviews the gaging of high and low limits of 3A threads, sampling techniques, and even the methods of gaging gages.

All standard Unbrako socket screw products fall within specified tolerance limits no matter what method is used to gage them. Leading industrial distributors carry complete stocks. Unbrako Socket Screw Division, Standard Pressed Steel Co., Jenkintown 19, Pa.



Form 2239, "Class 3A Threads: what they are; how to gage them." 16 pages, with many illustrations. Write for free copy today.

STANDARD PRESSED STEEL CO.



SOCKET SCREW DIVISION





Tool Steel Topics



On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation



New Equipment, With Die of Lehigh H, Ups Production of Cabinet Parts 200 Pct

The F. H. Lawson Co., Cincinnati, maker of bathroom cabinets, recently increased production of body blanks about 200 pet by installing a high-speed notching and cut-off operation, which is automatic from the coil to the body blank. It includes a 20-piece die, made of Bethlehem Lehigh H tool steel which had been supplied by Solar Steel Corp., Cincinnati.

In the new setup, a decoiler pulls 20-gage steel stock through the stretcher leveler into the Lehigh H die, where it is notehed and blanked at about 50 strokes per minute. The die, hardened to Rockwell C 61, passed its first five months of service without any need for redressing.

Lehigh H is an ideal tool steel for blanking jobs and other severe applications, because of its wear- and shockresistance, plus its high compressive strength. Lehigh H is our special-purpose high-carbon, high-chromium grade of airhardening tool steel.

TYPICAL ANALYSIS

Carbon 1.55 Molybdenum 0.80 Chromium 11.50 Vanadium 0.40 There's probably more than one application in your shop where Lehigh H tool steel could do a real job. Why not try it? All you need do is get in touch with your local Bethlehem tool steel distributor.

BETHLEHEM TOOL STEEL ENGINEER SAYS:



Grinding Cracks Not Always Fault of Grinder

As a rule the grinding cracks which sometimes appear during the finish-grinding of hardened tools are attributed to improper grinding practice. They can be caused by:

- Seorehing by removing metal too rapidly.
- 2. Dull or loaded grinding wheel.
- 3. Too fine a grit size.
- 4. Ineffective use of coolant.

But grinding technique is not always to blame. For example, a tool which has not been adequately tempered after quenching, or one that has become embrittled by an excessively high quenching temperature, may be impossible to grind without cracking, regardless of the care used in grinding.

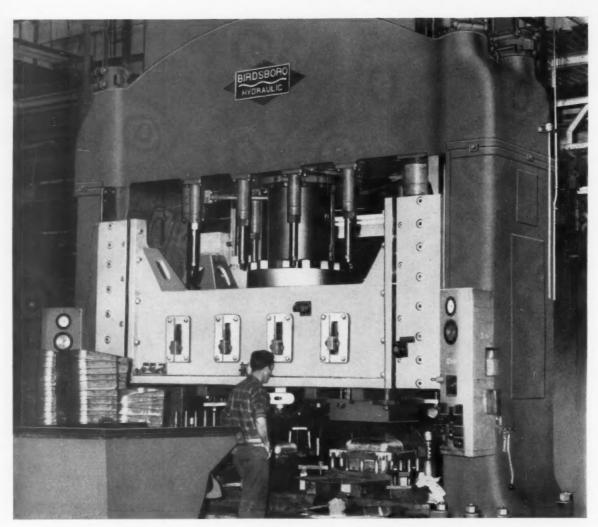
Unless the cause of the cracking is obvious, we recommend a complete investigation. Once the source of the trouble is known, it's easy to specify the cure.



CARBON WATER-HARDENING ECONOMICAL IN HEADING DIE STEEL

This heading die is being finish-ground prior to manufacture of $^5\mathrm{s}$ -in. diam button-head track bolts. Hardened to Rockwell C 60, and working on C 1016 steel, it can produce about 100,000 pieces between grinds. Bethlehem Carbon Water-Hardening steel has high shock-resistance, and its controlled carbon range gives it ability to withstand the effects of wear and cold-battering. When used in cold-heading applications, the correct degree of hardenability must be supplied.

MACHINERY, April, 1957-113



Here's Hydraulic Press speed, flexibility and accuracy to help you protect profit margins in sheet metal fabrication

• Through BIRSDBORO advanced engineering, large sheet metal stampings can now be turned out faster to close tolerances by this single action, deep draw Hydraulic Press. Design features allow quick changing of dies for more flexible operation.

The press is of the housing and shrunk tie rod type with hydro-pneumatic cushion of 180-ton capacity in the bed. The main ram capacity is 600 tons and the working area 144" left to right, 60" front to back, and 60" daylight opening.

When you're thinking about more profitable operation, call BIRDSBORO in to check over your problems. We'll come up with the specific press recommendations to meet your requirements.

BIRDSBORD STEEL FOUNDRY AND MACHINE CO.

BIRDSBORO, PA. District Office: Pittsburgh, Pa.

Engineering Subsidiary: Engineering Supervision Co., 120 W. 42nd St., New York 36, N.Y.

STEEL MILL MACHINERY - HYDRAULIC PRESSES (Metalworking and Extrusion) - CRUSHING MACHINERY SPECIAL MACHINERY - STEEL CASTINGS - "CAST-WELD" Design - ROLLS: Steel, Alloy Iron, Alloy Steel

Tear this chart out and preserve it

GRADES TOOL STEEL WORK YOUR GUIDE TO COLUMBIA HOT

TYPE AND GRADES	DESCRIPTION	HARDENING	QUENCH	TEMPERING	USEFUL
T1 — CLARITE HW	Full tungsten hot work steel with modified carbon and vanadium for highest resistance to softening at elevated temperatures with best wear resistance and medium toughness.	2100° F. to 2250° F.	Oil or Salt Bath	1050° F. to 1250° F.	58/52 Rc
H24— FORMITE NO. 3	A high tungsten hot work steel with good heat resistance to softening and wear, good toughness.	2000° F. to 2200° F.	Oil or Air	1050° F. to 1250° F.	56/48 Rc
H21 — FORMITE NO. 2	Reduced tungsten hot work steel with good resistance to softening and wear and high toughness.	2000° F. to 2200° F.	Oil or Air	1100° F. to 1250° F.	54/42 Rc
M10 — MOLITE HW10	A high molybdenum 2% vanadium steel with modified carbon for high resistance to softening and good wear resistance with high toughness.	1800° F. to 2100° F.	Oil or Air	1100° F. to 1250° F.	56/48 Rc
H13 — VANADIUM FIREDIE	Air hardening chromium molybdenum 1% vanadium for die casting aluminum, may be water cooled.	1825° F. to 1900° F.	Air	1000° F. to 1200° F.	52/38 Rc
H12 — ALCODIE	Chromium molybdenum tungsten vanadium air hardening hot work steel, resists softening with good resistance to wear and heat checking	1825° F. to 1875° F.	Air	1000° F. to 1200° F.	52/38 Rc
H11 — FIREDIE	Chromium molybdenum with 1/2 % vanadium air hardening type with widest range of uses, good resistance to softening and wear with high toughness and may be water cooled.	1800° F. to 1850° F.	Air	1000° F. to 1200° F.	52/38 Rc

HEIGHTS, ILLINOIS 1957 COMPANY . CHICAGO TOOL STEEL COLUMBIA

CENTRAL OFFICE AND WORKS, CHICAGO HEIGHTS, ILLINOIS — BRANCH STOCKS IN THE FOLLOWING CITIES.

REPRESENTATIVES IN THE FOLLOWING CITIES: Dayton, Erie, Grand Rapids, Harford, Indianapolis, Louisville, Moline, Newark, Portland and St. Paul Cleveland 14 | Defroit 3 | Conclinati 25 | Cleveland 14 | Defroit 3 | Los Angeles 29 | Milwaukee 4 | St. Louis 13 | Alixaukee 4 | Alixaukee 4 | St. Louis 13 | Alixaukee 4 | St. Louis 13 | Alixaukee 4 | Alixauke



COLUMBIA TOOL

DIE STEELS: Superdie — Atmodie — E-Z.Die Smoothcut — ExI-Die — CEC Smoothcut CARBON TOOL STEELS: Columbia Special — Vanadium Extra — Waterdie Extra — Columbia Extra Headerdie — Vanadium Standard — Colmbia Standard — HIGH SPEED STEELS: Clarite — Vanite — Acmite — Maxite — Molite Smoothcut — Molite * 3



PHILADELPHIA WORM GEAR REDUCERS

A complete range of unit types and sizes to cover applications from ¼ to 265 H.P. Ratios from 3½ to 1, to 6300 to 1. Our latest Catalog, WG-156, gives complete details . . . When requesting Catalog, please your business letterhead.

phillie gear

PHILADELPHIA GEAR WORKS, INC.

phia Worm Reducers.

ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.
Offices in all Principal Cities

Scientific design, unexcelled workmanship, finest materials, rugged construction, noiseless and

vibrationless operation, long-life and highest efficiency—are the "end results" that have earned an enviable reputation for Philadel-

INDUSTRIAL GEARS & SPEED REDUCERS . LIMITORQUE VALVE CONTROLS . FLUID MIXERS . FLEXIBLE COUPLINGS

Virginia Gear & Machine Corp. . Lynchburg, Va.

114B—MACHINERY, April, 1957

For more information fill in page number on Inquiry Card, on page 255



FACING use throw-aways for both purposes.





WHAT THEY SAY ABOUT WESSON MICRO-ADJUSTABLE BORING TOOLS

"We've cut boring down-time for tool changes we've cut paring appearance for radii criunges over 90% and cut tool costs from \$35 to only

"So good, we are now using micro-adjustable 22 cents per 1000 pieces."

"So good, we are now using micro-adjustable boring bars in place of single point turning tools, cutting tool costs, scrap and down-time." "Micro-adjustable boring bars with throw-aways micro-adjustable boring bars with throw-aways have cut tool costs on one operation from \$13,800 per year to only \$1036."

Revolutionary WESSON tools uncover and cut hidden costs and scrap, improve finish

Micro-Adjustable **Boring Bars** With Throw-Aways Sweep Industry

 Λ nnounced barely six months ago, the Wesson line of micro-adjustable boring bars designed specifically for the use of throw-away inserts has taken metalworking by storm, replacing conventional boring tools, reamers, single point tools, and multiple point boring tools in scores of applications. They are even being used for OD turning.

So general has been the acceptance and so broad the demand that the Wesson line of micro-adjustable boring tools has been expanded to a wide range of types, both standard and special. Shown here are just a few of the styles now in use in industry.

Wherever they have been applied they have shown tremendous savings in tool cost, greatly reduced machine down-time for tool changes, and minimized scrap due to boring tool adjustment. Largely contributing to this end are:

MICRO-ADJUSTMENT, an exclusive Wesson feature which provides a positive adjustment for diameter of 0.001 inch for every graduation of the screw-head dial.

ELIMINATES GRINDING of tools. THROW-AWAY inserts permit from 6 to 10 indexes to new cutting edges before discarding the insert.

LOW COST of inserts, greatly reducing outlays for consumption tooling.

(continued on page 2)

carbíde

Micro-Adjustable Boring Bars

(Continued from page 1)

STANDARD PARTS used wherever possible to permit interchange between different boring tools, reduced inventories, etc.

CHIP CONTROL—complete with built-in adjustable chip breaker, making tools equally adaptable to long and short chip work.

LONG LIFE per tool change. In practically every case, pieces per cutting edge are higher than previous tool performance without any change in speeds, feeds or cuts.

A complete new Wesson brochure covering these boring tools has been prepared. Ask for Catalog #MB-157.



Newest No-Skill Grinder

Improved model of Wesson's Poweramic Grinder which automatically produces hone-like tool finishes at low cost in less time. It protects the tools against faulty grinding. Practically no skill is needed. Among the features responsible is Wesson's exclusive Tru-Arc grinding principle. Ask for Bulletin #PG-157.



WESSON COMPANY DEPT. AD 1220 Woodward Heights Blvd., Detroit 20, Mich.

WESSON CUTTING TOOLS, LTD.



TABLE 1				
	BEFORE	AFTER		
Tool used	2-bladed Reamer	Micro- adjustable boring bar		
Carbide used	C-6	Wesson WH		
Cutting speed, rpm	155	155		
Feed rate per revolution	.012 ipr	.012 ipr		
Machining time	(cycle unchanged)			
Tool change time	4 minutes	60 seconds		
Pieces per tool change	100	406		
Pieces per blade or insert, total	400	3200		
Grinding cost, each	\$0.875	None		
Total grinding cost per tool	\$3.50	None		
Initial tool cost	\$11.50	\$0.72/insert		
Total cost per 1000 pieces	\$37.50	\$0.22		
Total tool change down- time per 1000 pieces	40 minutes	2½ minutes		

Throw-Away Boring Tool Gives Better Finish Than Reaming and Cuts Tool Cost 90%

Wesson's micro-adjustable boring bars with square throw-away inserts replaced two-bladed carbide reamers in an automotive transmission plant with the following results, without change in output rate:

- 1. Down-time for tool changes cut over 90%.
- 2. Finish improved.
- Consumption tooling cost reduced from \$35 per 1000 pieces to 22 cents per 1000 pieces.

4. Reduced tool inventory.

The parts are pearlitic planet pinion carrier housings of about 200 Brinell. Reamer output was 100 pieces per grind. This jumped to 400 pieces per cutting edge for the throw-aways. The number of shut-downs for tool changes was cut 75% and shut-down time per change also cut 75%. Net gain well over 90%.

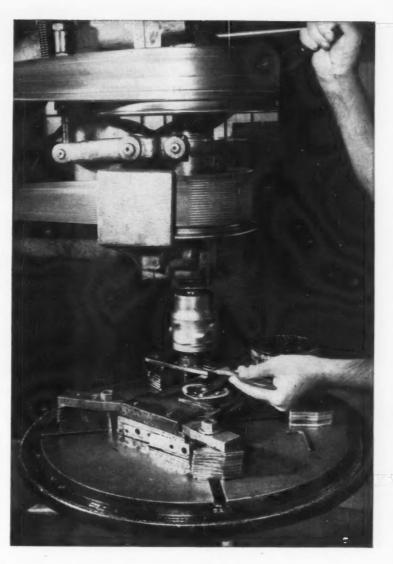
Micro-adjustment is required only for initial setup. After that, simple indexing insures accurate adjustment. Inserts are of Wessonmetal WH.

PLANING WITH "THROW-AWAYS"

The planing operation shown here forecast some years ago that throwaways were coming. It shows a Wesson MX-9 Multicut holder with a throw-away insert of Wesson's broad-range Grade 26 steel cutting grade, taking a 3/4-inch depth of cut without any trouble on mill plate at 200 feet per minute. Planing is another of the big fields served by Wesson "No-Grind" holders and indexable inserts. Ask for Catalog # 5510-M



"INCREASED TAP LIFE FROM 250 TO 4000 PIECES"



Cities Service Chillo Cutting Oil produces astounding results for C. S. S. Machine & Tool Company, Philadelphia, Pa.

Metal stamping... precision grinding... machining... stud welding... tool and die making. These are some of the expert operations performed by the 120 skilled employees of C.S.S. Machine & Tool Company of Philadelphia... operations based on many years' knowhow and teamwork. And for the past year, with Cities Service cutting fluids, this work has been done with even greater precision, greater efficiency than ever before.

In its tapping operation, for example, C.S.S. increased tap life from an average 250 pieces to over 4000 pieces with Cities Service Chillo Cutting Oil. And in a drilling operation with its Brown and

Sharpe Automatics, time required to make one piece was cut from 240 to 165 seconds!

Says President F. G. Schutz: "Cities Service Chillo Cutting Oils are the best we've ever seen. Likewise, Cities Service Lubrication Engineers. It's wonderful to deal with someone who knows our operation so well and has products that help improve it."

If you have a lubrication problem, or even if you're running smoothly, talk with a Cities Service Lubrication Engineer. He's known for solving problems, known for making smooth operations still smoother. Or, if you prefer, write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES (SERVICE

QUALITY PETROLEUM PRODUCTS





"Cool-Grinding" Attachment for DoALL Precision Surface Grinders

Colant is fed to the sides of the wheel. Centrifugal action pulls it threugh the wheel and out at the periphery in a fine mist. This keeps the workpiece from overheating at the point of cut where the heat is generated. Flood cooling is also provided but can be shut off when work visibility is paramount.

SEND FOR CATALOG



... contains complete description of "Cool-Grinding" and ail models of DoALL Precision Surface Grinders.

ASK FOR FREE DEMONSTRATION AT YOUR PLANT

You can see "Cool-Grinding" in action right in your own plant on a DoALL mobile demonstration unit. Ask your DoALL demonstration specialist to call—there is no obligation.

Coolant Does Not Obstruct Operator's View . . . User Ups Production 250%, Wheel Life 350%

In DoALL "Cool-Grinding", coolant is introduced into the sides of the wheel and flows out in a mist at point of cut. There is no heavy coolant stream and no coolant nozzle to obstruct the operator's view of the work. Hence, the only reason for ever employing costly dry grinding is eliminated.

Here is how Milwaukee Precision

Here is how Milwaukee Precision Grinding Corporation, Milwaukee, Wis,, gained by switching from dry grinding to DoALL "Cool-Grinding" on the intricate and difficult job pictured:

 Burning and warpage of work eliminated—formerly, losses were excessive.

2. Finish improved—a harder, finer grit wheel can now be used.

3. Production increased 250%—they now do in two days what formerly took a week.

4. Wheel life increased 300% to 400%—costly wheel dressing taking 1½ hours now done ½ as often and fewer wheels consumed.

fewer wheels consumed.

Before "Cool-Grinding" was used, this job was a headache nobody wanted. Milwaukee Precision Grinding took it as a challenge... and found the answer.

a challenge . . . and found the answer.

Do you have toolroom or production
line jobs you are grinding dry because
the operators have to see the work?



THE JOB NOBODY WANTED—grinding the slots in this cavity die insert used in molding plastic sockets for TV tubes. % of the weight of the piece is removed by grinding. A headache with dry grinding, "Cool-Grinding" made it routine.

Then, find out about DoALL Precision Surface Grinders with the "Cool-Grinding" attachment. You can use coolant without obstructing visibility, increase your production and cut your costs.

Call your local DoALL Store or write:

The DoALL Company
Des Plaines, Illinois



Friendly DoALL Sales-Service Stores in 38 Cities

Cool Grinding U.S. Pat. No. 2470350



If you haven't read this important booklet, your production line may be operating at less than peak efficiency. Your operations may be beating competition with HSS today, but you will likely need carbide tooling to be the leader tomorrow.



Write for your free copy of this important booklet today!



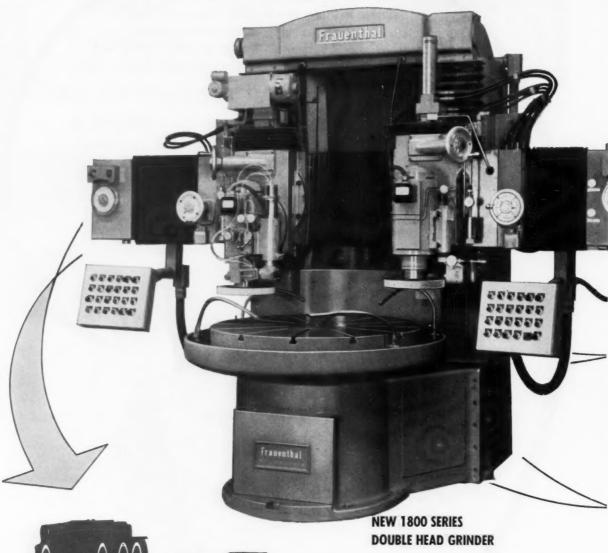
Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.

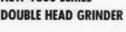
For more information fill in page number on Inquiry Card, on page 255

MACHINERY, April, 1957-117

PRECISION-GROUND



MACHINE TOOLS

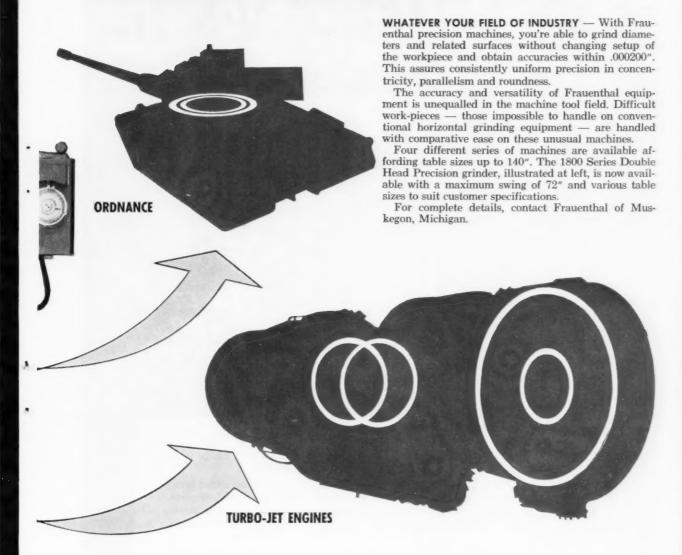




For complete details on Frauenthal 1800 Series Double Head Grinders, write for catalog.

Frauenthal Division

COMPONENTS . . .



MACHINE TOOLS — Modern day machine tools are required to produce piece parts to greater accuracy than ever before. Therefore, machine tool components must be more precise to the nth degree. With Frauenthal grinders you can grind collets, chucks, spindle sleeves and similar components under simulated assembly conditions to assure concentricity, parallelism and roundness. Eliminate costly and time consuming hand scraping and grind plated parts prior to and after plating for increased wearability.

TURBO-JET ENGINES — Diffuser cases, rotors, compressor discs, vanes, etc., are components of jet engines ground on

Frauenthal equipment. Thin section parts, which are unstable due to their design, are ground on the horizontal rotary table of the 1800 and 3100 Series machines. The compound and spindle angle setting features permit the grinding of surfaces normally inaccessible on conventional equipment.

ORDNANCE — Large bearings and housing components for ordnance applications are ground on the 1800 and 2200 Series grinders. Applications vary from aircraft gun turret bearings to the large turret bearings required for tanks, motorized gun carriages, radar and naval gun mounts.

No. F-257

THE KAYDON ENGINEERING CORP.



30 to /
SPEED RANGE!

FINGER TIP CONTROL!

Get fast speed changes over a 30 to 1 range with this all-electric variable speed drive.

The new V*S Jr. gives you instantaneous speed changes, even under load, without belts, pulleys, or gears. This Reliance Drive puts the complete machine operation at the operator's fingertips. All functions, jog, start, stop, reverse and speed changes, are placed in a compact, remote control station.

There's a big power cushion in the motor, too... power for smooth speed pick up, even under heavy shock loads, and dynamic braking for fast controlled stops without shuddering or jerking.

The Reliance V*S Jr. is your answer to machinery drive problems in the ¾ to 4 horsepower range. Package construction makes installation easy; just plug it in to a single phase 220 or 440 volt a-c. line.

Write for complete details and prices.

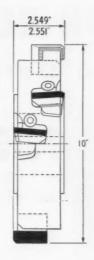
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RELIANCE BELECTRIC

AND ENGINEERING COMPANY

DEPT. 34A, CLEVELAND 17, OHIO • CANADIAN DIVISION: WELLAND, ONTARIO Sales Offices and Distributors in Principal Cities



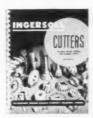


2700 cu. in. of 1045 steel without resharpening at The Bullard Company

This ten inch, inserted blade, staggered tooth channeling cutter used by The Bullard Company, manufacturers of machine tools in Bridgeport, Connecticut, demonstrates long tool life of Ingersoll cutters on tough jobs. The cuts are $2\frac{1}{2}$ " wide. $1\frac{1}{16}$ " deep at a cutting feed rate of 6" per minute. The parts to be cut are $67\frac{1}{26}$ " long tool slides for the Bullard "Cut-Master" turret lathe.

The advantages of long life and dollar savings made possible by Ingersoll inserted blade cutters are being realized on all makes of machines, milling and boring a wide range of materials. An Ingersoll Cutter Division representative will be glad to discuss this and other long-tool-life experiences with you.

Whether you are concerned with tool life, feed rates, cutter costs or finish, the new Ingersoll cutter catalog will be a valuable guide. Write for your copy today, address Dept. 66B.



Use this new 82 page guide for selecting the <u>right</u> inserted blade milling and boring cutters for <u>your</u> work. Write for catalog #66, today.

Representative Ingersoll Customers in Diversified Industries

ALUMINUM COMPANY OF AMERICA

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BUCYRUS-ERIE CO.

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FORD MOTOR COMPANY OF CANADA, LTD.

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THE INGERSOLL MILLING MACHINE COMPANY

ROCKFORD

ILLINOIS

For more information fill in page number on Inquiry Card, on page 255

MACHINERY, April, 1957-121

PRECISION REQUIRES SPECIAL

and Gets it with FEDERAL



If you are not kidding yourself about Precision you know you have to gage a dimension a certain way if you want an accurate measurement,

That's why good gage users know that just any gage is not good enough. And that is why Federal makes so many different types of gages of the same general kind.

There are all degrees of accuracy required and

Whatever You Need in Gages

Ask FEDERAL First



4 sizes cover all

diameters

Model 149P I.D. Caliper Gage (also Model 49 O.D. available) Stock and Special Models of All Shapes



Model 1203 .122"-.250" Diameters

Model 1204 .250"-.506" Diameters Model 1242 Series (Two-contact) Model 1243

Model 1243 Series (Three-contact)

Many Other Types.

Send for Catalog.
Illustrates the most extensive
line available.

Model 36 Series
Bench Type Hole and
Outside Diameter Gages



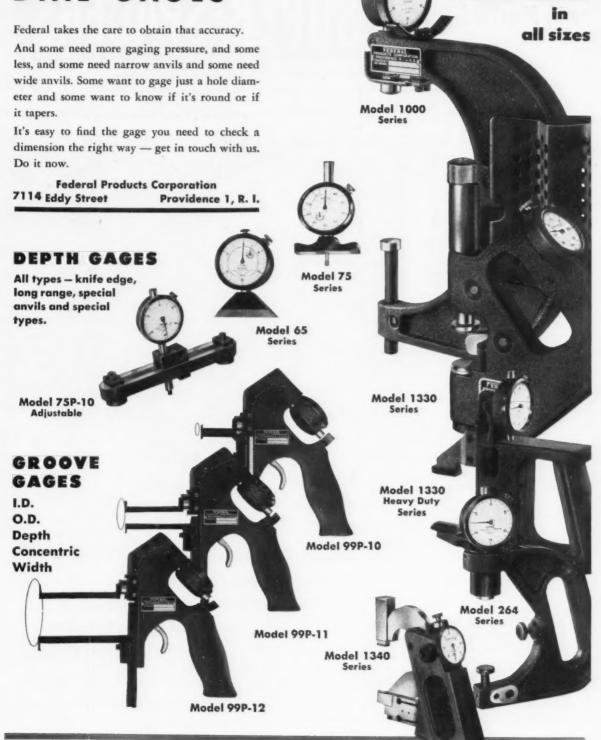
Model 1201 Series

Model 165 Series Single Purpose Plug Type

Gages Can Be Modified Specially to Suit



TREATMENT DIAL GAGES



OVER 12 TYPES

INDEX short or long runs on a production basis

with Hartford Special

- Quick, easy setups without expensive jigs or fixtures.
- Positive, rapid indexing accuracy in a minimum of .00116" on a 4" radius,
- Super-Spacer can be indexed visually to any degree setting with Vernier accuracy, and locked in position.

12" SUPER-SPACER

Length overall: Width overall: 121/2 Base to chuck face: 613/2 Width of keys: Thru hole diameter: 4"

Chucking diameter: 1/2" thru 121/2" O.D.

Weight: 190 lbs.

Mask plates for divisions from 2 through 27 are available from stock. 2, 3, 4, 6, 8, 12, 16 and 24 notch plates are furnished with the standard unit. Special mask plates for unequal spacing made to order. 48 notch master index plate furnished with standard unit. Special master index plates for 27 through 54 divisions carried in stock. Special index plates for unequal spacing made to order.

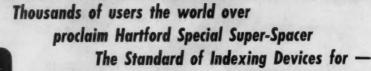
8" SUPER-SPACER

Length overall: 121/4" Width overall: 101/4" Base to chuck face: 11/16" Width of Keys: 21/2" Thru hole diameter: Chucking capacity: 1/8" thru 8" O.D. Weight: 110 lbs.

Mask plates for divisions from 2 through 18 are available from stock. 2, 3, 4, 6, 8 and 12 notch plates are furnished with the standard unit. Special mask plates for unequal spacing made to order.

24 notch master index plate furnished with standard unit. Special master index plates for 16 through 36 divisions carried in stock. Special index plates for unequal spacing made to order.







Milling Boring Inspecting Drilling Slotting and other Tapping Planing **Machining Operations**

A complete line of accessories available. See the Hartford representative in your

area or write for Bulletin S-104.

MACHINE TOOL ACCESSORIES DIVISION THE HARTFORD SPECIAL MACHINERY CO.

2904 HOMESTEAD AVENUE HARTFORD 12, CONN.



eem) solves a "toughie"

and increases production

three hundred per cent

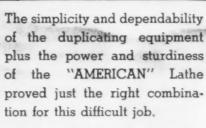
Machining the various contours of these guided missile components with the accuracy and finish required was a problem that Rheem Mfg. Co., Aircraft Division at Downey, California, had to lick.

The MERICAN"

HYDRAULIC DUPLICATING LATHES

These pieces are now machined inside and out from the rough forging, with the accuracy and degree of finish demanded, in 68 minutes floor to floor—removing 23 pounds of metal from each piece.





We specialize in "tough ones"
—better ask us about your
"problem" jobs.

THE AMERICAN TOOL WORKS CO.

Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

The world's most accurate

Now distributed in the United States and Canada by Jacobs and your Jacobs chuck distributors

The Albrecht Heavy Duty Drill Chuck

- Keyless construction
- Excellent gripping power
- Self tightening smooth release
- · Very high accuracy
- Drill breakage minimized
- For tool room and the production line





The Albrecht Heavy Duty Drill Chuck is available in 11 taper back models in capacities up to %". This is a keyless, self-tightening chuck of exacting accuracy.

The Albrecht Small Drill Chuck Model No. 15 JO



Model 15 IO is especially designed for small diameter drills. It has a maximum capacity of 1/16" and a minimum well under the No. 80 drill. Like the heavy duty models, No. 15 IO is keyless, and self tightening.

The superlative performance of this precision chuck is now available to you through your Jacobs industrial supply distributor. He is backed up by replacement parts stocked in the United States, plus the finest service facilities anywhere.

Call your Jacobs industrial supply distributor for full details and your copy of the new Albrecht catalog.

keyless drill chuck



Close tolerance drilling easily accomplished on a tool room milling machine.



Get the finest performance from your jig borer with the world's most accurate keyless drill chuck.

Albrecht Chucks are ideal on milling machines and jig borers



The Albrecht Keyless Chuck is ideal for use on high speed sensitive drilling machines.

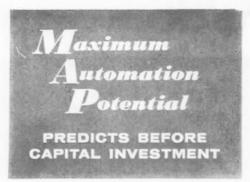


The Albrecht Small Chuck, Model 15 JO, is the finest keyless chuck available for accurate drilling of the smallest holes.

Close tolerance drilling on high speed drill presses

Jacobs CHUCKS

The Jacobs Manufacturing Co. • West Hartford, Connecticut



Metal removal costs too high?

Carborundum's new M-A-P Method gives <u>you</u> a chance to compare the advantages of coated abrasives

Maximum Automation Potential

is a metal removal prediction method—predicts cost savings and production increases with the use of abrasive belts on your present or planned production operations. M-A-P is a new engineering service provided by The Carborundum Company. Now you can compare the advantages of using abrasive belts on either heavy metal removal or on the finishing or semi-finishing operations of any component part you manufacture.

M-A-P metal removal recommendations are made for you by Carborundum's coated abrasives engineers at the Carborundum plant. A study is made of your specific operation based on a few simple production facts which you provide and an M-A-P recommendation is mailed to you without cost or

obligation—gives you the opportunity to know what savings can be expected before making a material or equipment change.

M-A-P predictions are based on facts accumulated through Carborundum's many years of abrasive experience and the abrasive machinery know-how of its Curtis Machine Division. These abrasive facts have been developed into M-A-P formulas—new positive standards for every factor which enters into grinding metal with abrasive belts.

To determine *your* Maximum Automation Potential with abrasive belts write for the M-A-P Brochure which explains this new service to industry in detail. Address inquiries to: Dept. 49 M-A-P, Senior Coated Abrasives Engineer—

The CARBORUNDUM Company

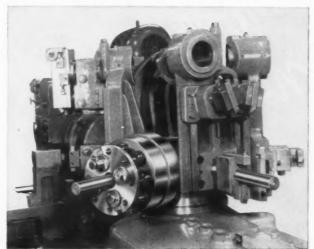
COATED ABRASIVES DIVISION

Niagara Falls, New York



Passes Stiff Production Test with NO BAD MARKS!





- A POTTER & JOHNSTON 6DRE-40 AUTOMATIC . . . does the job quickly, economically.
- P&J-ENGINEERED TOOLING . . . insures fine finishes with NO RETURN TOOL MARKS.

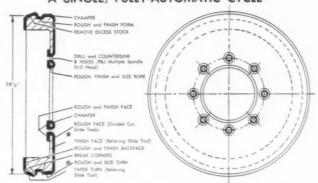
Job Facts:

THE PART: Cast iron tub bottom.

REQUIRED: 26 separate roughing and precision finish cuts including: 2 critical surfaces to be machined without return tool marks... and 8 holes on a diameter to be drilled and countersunk.

MACHINING: Finished in just 8½ minutes per piece . . . floor-to-floor timel Use of relieving slide tools eliminated return tool marks; a P&J Multiple Spindle Drill Head handled all 8 holes simultaneously; no need for a secondary operation; extensive use of standard, basic tools throughout the entire setup kept tooling costs to an absolute minimum.

A SINGLE, FULLY-AUTOMATIC CYCLE



HEAVY LINES INDICATE MACHINED SURFACES

Several factors — the number and complexity of the cuts involved, the high accuracy and fine finishes required, and the speed with which these pieces are produced . . . make this an unusually interesting job. But remember, performance like this is the rule — not the exception — when you team a Potter & Johnston Automatic Chucking Turret Lathe with P&J Tooling. Here is a winning combination that can help you improve qual-

ity, increase output and cut costs on your toughest jobs. Send now for complete information on the 6DRE-40 and the other Automatics in the complete P&J line. Write to us direct . . . or phone the Pratt & Whitney Branch Office near you for a Direct-Factory Representative to discuss your requirements. Potter & Johnston Company, Pawtucket, Rhode Island (Subsidiary of Pratt & Whitney Company, Inc.).



POTTER & JOHNSTON

Precision Production Tooling for more than Fifty Years
AUTOMATIC TURRET LATHES • NEWARK GEAR CUTTERS



ARMSTRONG GENERAL CATALOG NO. 57

Listing approximately 5,000 quality tools for industry, including:

- ★ Tool Holders (The complete Armstrong System)
- ★ Cutting Tools (Tool Bits, Cut-off Blades, Carbide Cutters and Inserts)
- ★ Lathe and Milling Machine Dogs
- * Set-up and Hold-down Tools
- * Machine Shop Specialties
- ★ Drop Forged "C" Clamps
- ★ Parallel and Machinists' Clamps
- ★ Drop Forged Eye Bolts and Hoist Hooks

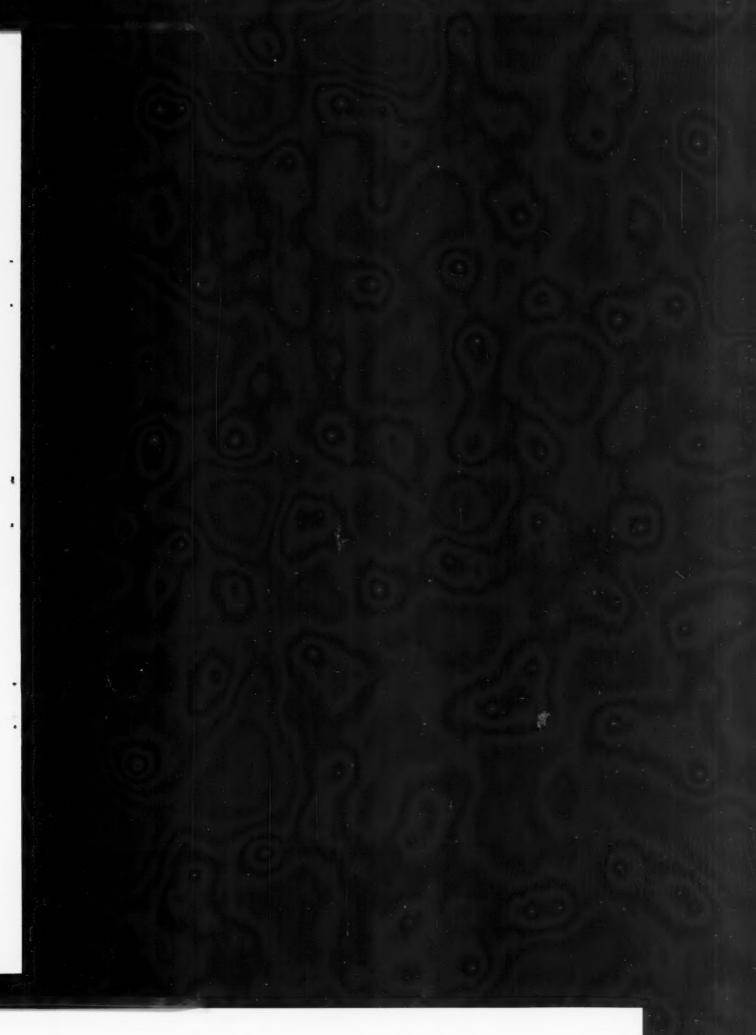
- ★ Drop Forged Machine and Crank Handles
- ★ Drop Forged Wrenches
- * Detachable Sockets and Drive Parts
- * Bridge Ratchets and Sockets
- * Adjustable Wrenches
- * Torque Wrenches
- * Pipe Tools
- * Chain Tongs

No industry reference file is complete without the new Armstrong No. 57 Tool Catalog

ARMSTRONG BROS. TOOL CO.

W. ARMSTRONG AVE. . CHICAGO 30, ILL

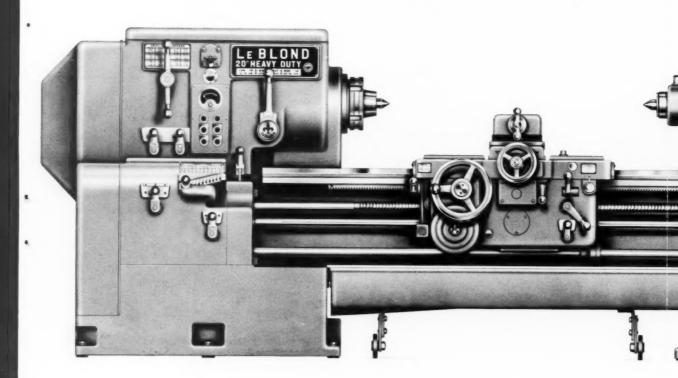
Rwy ARMSTRONG TOOLS from your Industrial Distributor



ALLNEW

20" Heavy Duty

power and toughness to use all the bite



The new LeBlond 20" gives you all the rugged design and construction of the toughest heavy duty turning machines in the world. Power, rigidity, stamina—dramatic new features and new human-engineered operator convenience. Here's why you'll want LeBlond 20"s fighting the production battle on *your* side!

Smooth, usable 40 H. P.—to get the most from today's advanced tools! In the headstock, extremely short, heavy shafts and fine-pitch precision-ground gears deliver power efficiently to the spindle—with minimum no-load horsepower. Plenty of power at lowest speeds, too! For example, at 10 rpm you can take a cut as deep as ½" in 16" diameter work, feeding at .063 ipr!

36 high-power speeds. Selections made in fine increments, particularly in the low range where small differences in

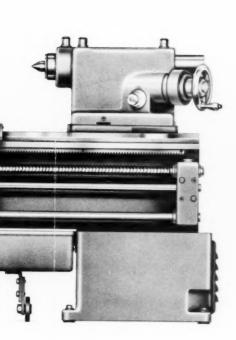
rpm make big differences in tool life. 36 speeds, 10 to 1300 rpm in geometric progression. The tough, forged spindle is supported in 3 places by 5 bearings. DC speed selection at apron available with simplified gearing in head.

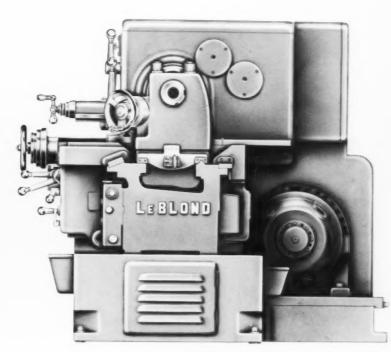
All-new 2-speed tailstock. Tailstock spindle travel is geared for conventional and low speed. When drilling, for example, push handle *in* to drill at slow, powerful feed; pull handle *out* to retract quickly. Tailstock can be moved by power. Exclusive LeBlond worm and rack construction puts handwheel at a convenient angle to the operator, provides exceptionally long travel and positive safety lock against thrust. Full-length support of spindle, even when extended.

Scientifically planned operator convenience. Human-engineered for operator convenience, the controls of the

LEBLOND y Engine Lathe

bite of today's ceramics and carbides!





new LeBlond 20" were scientifically studied for shape, ... cut with confidence size and location. To simplify speed and feed selection, levers are always moved toward operator position for increase, away for decrease. Speed selection is color coded. Spindle is sensitively controlled by means of electric clutch and brake. 4-directional power rapid traverse controlled by single lever. In addition, built-in horsepower meter, chasing dial integral with apron and quick-setting diameter reading dials on crossfeed.

Many famous LeBlond features. Hardened and ground replaceable steel bedways with compensating vee-way design, automatic lubrication to head, quick-change box, apron, single-shot to tailstock, hardened and ground crossfeed screw with compensating nut, one-piece apron, flame hardened rack, totally enclosed quick-change box.

Call your LeBlond Distributor or write for complete specifications.



THE R. K. LEBLOND MACHINE TOOL COMPANY

Cincinnati 8, Ohio

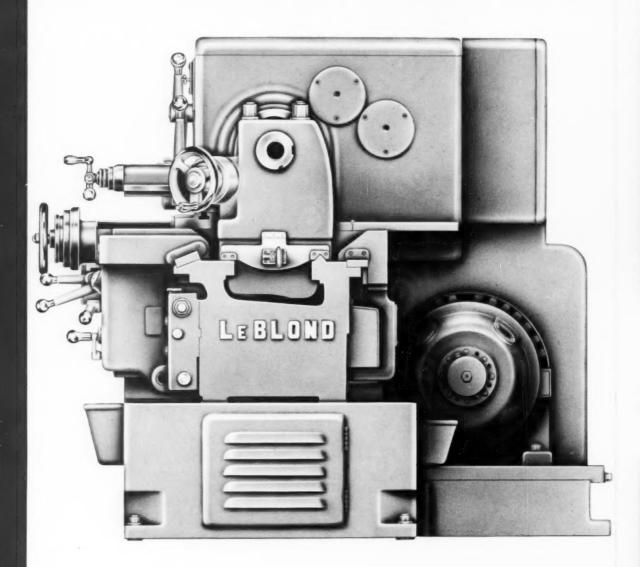
avel is drilling, owerful can be nd rack

to 1300 spindle

election

e to the positive spindle,

nan-enof the PACKED WITH POWER, RIGIDITY, STAMINA



ALLNEW LEBLOND

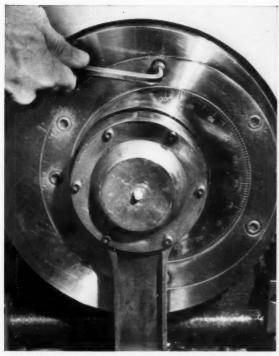
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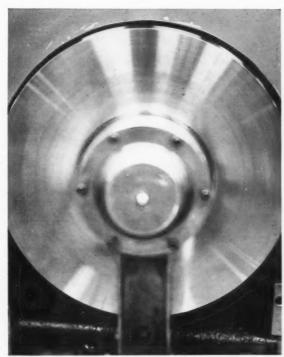
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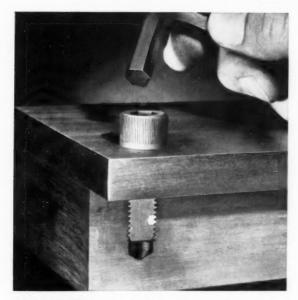




Self-locking Unbrako socket screws keep critical adjustments secure in the eccentric drive mechanism of this fatigue testing machine. Drive system delivers varying loads up to 15,000 pounds force to equipment under test at 1050 cycles per minute,

Vibration won't loosen Self-locking UNBRAKO socket cap screws

Screws with Nylok* device permit adjustments, keep precise settings during long test runs



HOW IT LOCKS. The tough, resilient Nylok locking pellet keys itself into the mating threads. It forces threads together, and locks the screw securely—whether or not the screw is seated.

UNBRAKO socket screws with the Nylok self-locking device stay tight under constant vibration.

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Write today for your copy of Form 2193, which gives complete catalog and technical data on the entire line of UNBRAKO socket screws with the Nylok self-locking device. Or see your authorized industrial distributor. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 19, Pa.

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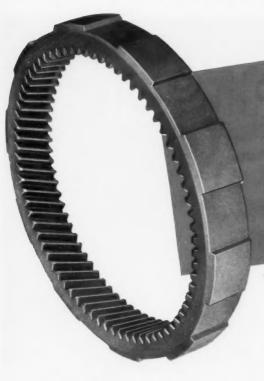
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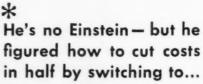


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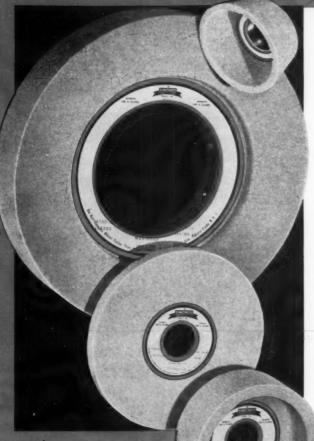




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SIMONDS SA Borolon

Grinding Wheels for Toolroom use

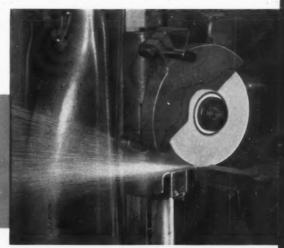


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Cooler cutting
Faster grinding
Longer life
Better finish

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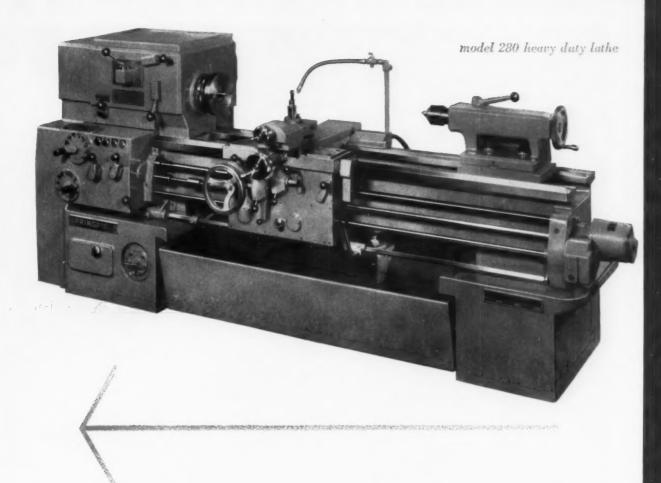
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Springfield is proud to present a new heavy-duty 16" engine lathe, the Model 280. It offers high horsepower—10, 15 or 20 hp—for heavy cuts, clean design, and ease of operation, all at a reasonable price. Direct simplicity and straightforward design assure low maintenance cost.

It has no electronic brain, because Springfield believes that most of today's jobs still require craftsmanship of the human variety. In the Model 280 the price is for the tool, not the brain.

Only the gears necessary for a given speed are in mesh. Sixteen speeds to choose from, 60 feeds and threads—available instantly to any operator. Unique sealed oil spray lubricates and cools gears. It's the lathe most easily converted to contouring and reproducing with accessories, without budget strain. If you're in the quality market for a new heavy-duty lathe that still respects the contribution of craftsmanship, the Model 280 is for you. Basic price FOB Springfield, Ohio, \$8,013.

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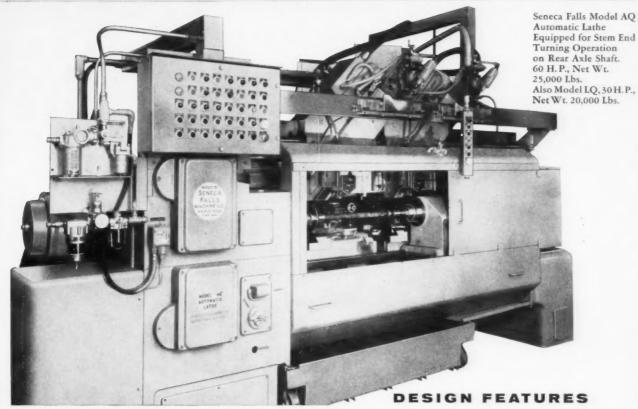


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• The new Models LQ and AQ Seneca Falls Automatic Lathes are designed to combine the best and fastest methods of rough and finish turning shafts on a single machine without removing the work and without attention on the operator's part.

The line drawing shows a machining operation on the stem end of a rear axle shaft which is rough turned with multiple tools on a rear carriage while finish turning is done with single, tracer-controlled tools on each of the two overarm carriages. Thus the advantages of multiple tooling for stock removal and single tool tracer turning for accurate finish operations are combined. By this method extremely close tolerances are maintained since the pressure of the single tool is constant over the entire length of the work piece, and full advantage can be taken of the higher cutting speeds now possible with the newer carbide and oxide tool materials.

The machining operation is completely automatic . . . the operator loads shafts between centers and pushes the starting button; multiple tools rough turn; tracer tools then finish turn; and finally the machine stops with all tools returned to starting position.

A similar type lathe is used for the flange turning operation. Varying application of multiple tooling or single tracers to either rear or overarm carriages is possible on these lathes and complete "in line" automation can be engineered to specific production requirements,

Seneca Falls Machine Co., Seneca Falls, N. Y. Write for Bulletin Q-56-B

▶ Simplified changeover features for reduced set-up time.

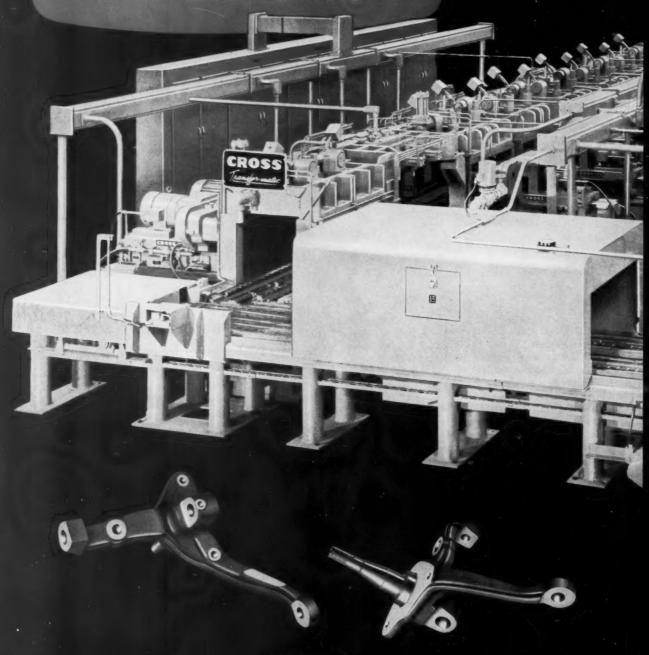
- Feed rate may be automatically changed during cutting cycle.
- ► Streamline design for efficient chip guarding.
- Screw feed to all carriages.
- Four speed head with automatic change-over.
- Large chip flow area.
- All templates clear of chip area.
- ► All ways hardened, ground and replaceable.
- Open front design facilitates loading and unloading.
- Straight line diameter adjustment for tracer tools . . . no shoulder length change to correct.

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Mills, Drills, Reams, Threads Integral Front Wheel Spindle and Steering Arm

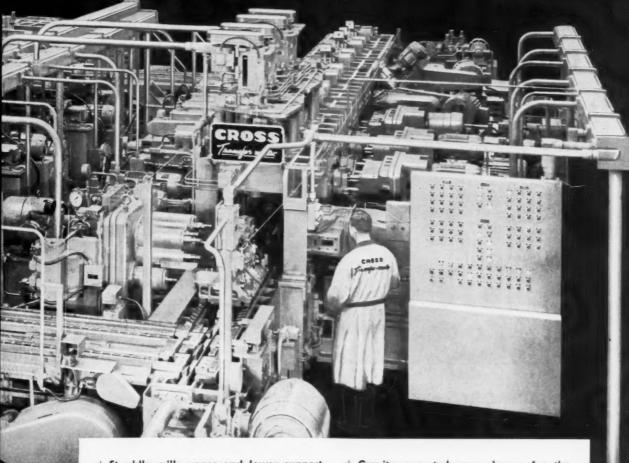


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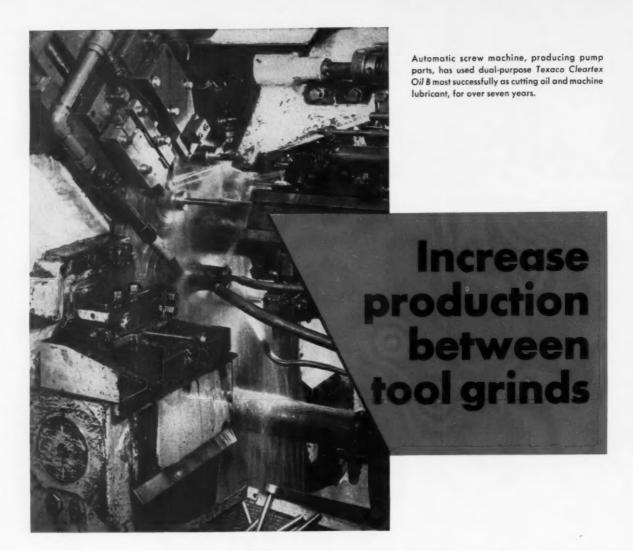
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- ★ Pallet type work holding fixtures locate parts from spindle bearing diameters.
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- Gravity operated cam clamps for the work holding fixtures.
- * Automatic transfer mechanism indexes right and left hand parts through all 17 stations in pairs.
- Automatic indexing units turn fixtures 82° at Stations 11 and 17.
- Cross modular unit construction provides flexibility for design changes.
- * Other features: construction to JIC standards; hardened and ground ways; hydraulic feed and rapid traverse for milling, drilling and reaming; individual lead screw feed for threading; automatic fixture cleaning unit; complete interchangeability of all standard and special parts for easy maintenance.



THE RIGHT LUBRICANT can do a lot toward speeding production, increasing tool life. Take, for example, *Texaco Cleartex Oil*. It's a multipurpose oil—cutting fluid and machine lubricant—with relatively high extreme pressure properties. Good stability and load carrying ability mean less wear on moving parts. And it's clear and transparent for faster, easier inspections.

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TUNE IN . . . METROPOLITAN OPERA RADIO BROADCASTS EVERY SATURDAY AFTERNOON

- New Weapons, New Metals, New Problems
- Increasing Labor Costs—Chicken or Egg?
- Of Many Things



Keeping up with Washington

By Loring F. Overman

Washington's slide-rule boys are giving metals and machinery folks a difficult time. Dreaming up supersonic weapons is one thing; producing them is quite another. Among agencies seeking to coordinate the two is the Manufacturing Methods Branch, formulated by Air Force Regulation 78-18. Operating out of Air Materiel Command headquarters at Dayton, the Branch is considered the bridge between the dream and its fulfillment. The program is not new, but emphasis on space missiles is spurring the drive to find materials that will meet requirements of which even research people are still unsure.

During 1956, the Branch completed eighteen projects and terminated six others. Of interest to machinery industries were: optical tooling, numerical machine control, low-cost miniature ball bearings, forged wheel centers for landing gears, hydroform presses, cored forgings, titanium extrusions, and a machining manual for titanium.

Among problems on the current schedule are several involving machine tool design and performance—high-speed cutting, chipless machining, and continued adaptation of numerical controls for machine tools. Another study has as its target the precision forging of compressor discs—fifteen or more are required for each jet engine. The current method machines away 90 per cent of the compressor disc—a loss of \$600 worth of material per disc.

Air Force officials have advised industry to anticipate methods of fashioning and fabricating parts made of molybdenum; magnesium alloys 30 per cent lighter than aluminum that can be used at or above 700 degrees F.; nickel and cobalt-base alloys with hardening elements of titanium and aluminum; steel-with-boron combinations; titanium; and others.

Chicken or Egg?

The spiral of increasing production costs, many of them involving labor, is one of growing concern in Washington. The Administration has warned both labor and business that increased productivity must precede any new wage or price advances. Paradoxically, many industrial wage rates are tied to the cost-of-living index. The index rises; wages follow. Next, up go prices to cover the increased labor cost; the cycle starts again. Meanwhile, in current legislative proposals in Washington, pressures for further increases in labor rates predominate.

Three major topics are under consideration: welfare fund regulation, Taft-Hartley Act amendments, and extension of coverage under minimum wage legislation. H.R. 2437 would require registration and periodical reporting on welfare benefit plans in order to qualify them for tax deduction under the Internal Revenue Code.

H.R. 430, labor-sponsored, would amend the Taft-Hartley Act to override state right-to-work laws. Other proposals, of similar intent, would open the way for compulsory unionism in states which now forbid it. S. 76, business-sponsored, would outlaw secondary boycotts. Another proposal, S. 676, would have just the reverse effect.

Proposals to increase the minimum wage level to \$1.25 an hour are not considered likely to pass, but legislation extending coverage to millions of persons in retail and service fields is gaining support. Forty-eight national headquarters of unions are located in Washington. All will be pushing pet proposals. Whether business and industry will be able to hatch eggs of a different shape remains to be seen.

Of Many Things

A study is being made of the Internal Revenue Service's schedule of suggested rates for use in determining the useful life of machinery and other depreciable property. The schedule is contained in IRS Bulletin "F," published in 1953. Suggestions and related data should be submitted in duplicate to the Commissioner of Internal Revenue, Washington 25, D. C., Attention: T:S:EA:F, not later than June 30, 1957.

Temporary suspension of licenses to export iron and steel scrap has been ordered by the Commerce Department. The action followed marked increases in applications for export permits.

A few in Washington, "crying in the wilderness," are urging budget cuts and tax reduction. Senator Byrd (D-Va.) feels that this country and the world would get along quite well without some five billion dollars in goods and services now demanded of Uncle Sam.

Senator Bridges of New Hampshire suggests a 2 1/2-billion-dollar cut. The Citizen's Committee for the Hoover Report is publicizing ways to save 5 1/2 billion dollars by streamlining government operations.

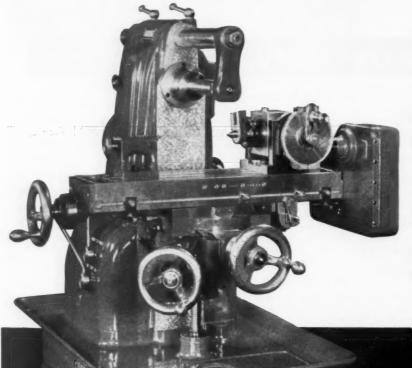
Opposite view—a more popular one with legislators—is voiced by Rep. Wilbur D. Mills, Ark. His view is that higher taxes are here to stay, and that we may as well get used to them. Business writers are urging opposition to such tax defeatism.

Federal stock numbers, under a new Federal Catalog System, have been assigned to 3,129,000 items, the Defense Department has announced. The remaining items (1,894,000) are designated reference-method items. All are of specialized design. The new system will become fully operative on July 1, 1957.

Like to sell machinery abroad? The Commerce Department has announced formation of an Industrial Exhibits Division in the Office of International Trade Fairs to assist American industry in exhibiting at trade fairs. Phillips B. Marsden, Maplewood, N. J., directs the new division.



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146-MACHINERY, April, 1957

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Two Long Years - Too Long!

THE Hoover Commission made its bipartisan recommendations for reforms in government operations back in 1955. After approximately two years, 39 per cent of the Commission's goals have been achieved, but an additional five billion dollars could be saved annually if Congress and the Administration would adopt the remaining recommendations.

Why has there been such a lag in following the recommendations, when adoption of the First Hoover Commission suggestions resulted in annual savings of seven billion dollars? Why—when the efficiency of government operations would be greatly increased, and the announced aim when the Administration took over the reins in 1953 was better government at less cost to tax-payers?

For one thing, it is difficult to institute more progressive methods when such a program brings about a reduction in personnel. Government employes are opposed to changes because they do not want to see a discontinuance of functions that provide their livelihood. Pressure groups spring into action, and politicians are loathe to take a stand that may cost votes. This is one of the reasons advanced for failure to implement the Hoover Commission recommendations in 1956—an election year. But why delay any longer when there are such glaring practices as preparing daily meals at military installations on the basis of a complete meal for every person assigned to the installation, regardless of the number of absentees? As a matter of fact, the Hoover Commission discovered that up to 20 per cent of such personnel is absent for various reasons on any given day and that millions of cooked meals are thrown away yearly. The savings that could be derived from an intelligent solution of this problem would amount to about \$200,000,000 annually.

The Post Office department has been clamoring for higher postal rates to overcome operating deficits. At the same time, it follows such expensive practices as using seven different types of specially built vehicles for handling mail. The Hoover Commission found that four standard production-line trucks would meet all requirements. If a policy were adopted calling for the use of standard vehicles, there would be a 20 per cent saving in the initial purchase price, another 20 per cent saving in operating costs, and a 20 per cent gain in resale value.

Congress will be asked to take action this year on approximately twenty new bills that cover five major fields. Presumably, they will receive bipartisan support, but will there be sufficient support to insure enactment of necessary legislation? As Herbert Hoover, himself, recently said, "Only the continued interest and good, hard work of citizens can reap the full benefits of this opportunity."

Every individual who feels strongly about this matter should tell his Senator and Representative of his opinions. Two years has been too long a time to wait for the adoption of recommendations that would result in tremendous monetary savings and greatly increased efficiency through the elimination of government waste. We should not be asked to wait any longer!

Charles O. Herb



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148-MACHINERY, April, 1957

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stainless steel, reinforcing bars, machinery & tools, etc.

CERAMIC TOOLS for single-point turning

Considerable study and test work in Monarch's Metal Turning Research Laboratory indicate that oxide tools can cut costs and improve production rates in turning parts to close tolerances at top speeds. Machine tools having ample horsepower, high speeds, and extreme accuracy are requirements for the efficient use of such tools.

By A. B. ALBRECHT, Metallurgical Engineer Monarch Machine Tool Co. Sidney, Ohio HE high-temperature properties and oxidation resistance of ceramic materials have always been of interest to the metalworking industry. It has long been recognized that higher metal removal rates and greater surface speeds can be obtained as the hardness and wear resistance of a cutting tool are increased.

Initial cutting tests with the dense aluminas proved that they could be applied to the machining of ferrous metals. This led to further development of higher strength sintered alumina ceramics for use as cutting tools. Early test work in 1955 with these ceramic materials produced inconsistent results. Breakage and non-uniformity due to processing difficulties accounted for this lack of reproducibility. Since then, a considerable amount of study and test work on oxide tools has been performed throughout the metalworking industry by manufacturers as well as various users of the tools.

In Monarch's Metal Turning Research Laboratory, the study has been two-fold in nature. First, basic cutting data was obtained for use in future design work. The performance characteristics of these new tools will ultimately determine how much redesign will be required in tomorrow's machine tools to take full advantage of their favorable properties. The second phase of the research was concerned with the application of ceramic tools to new model lathes. Ceramic tools were evaluated to determine the proper turning speeds and feeds for various materials, and where they could be best applied. This article deals with this area of the research program. The graph seen in Fig. 1, which shows the relationship between the hardness of the material to be cut and the suggested cutting speed, can be used to establish a starting point in the application of oxide tools.

Basic Advantages of Ceramic Tools

Basically, ceramics are brittle and have very little resistance to impact or impingement. Their main advantage over present carbides is greater hardness and strength at high temperatures. These features allow the use of higher surface speeds without loss of tool life. Ceramics are chemically inert, non-absorbent, and resistant to surface welding. Surface cratering at high speeds is caused by mechanical abrasion only, rather than by chip-tool welding, as is the case with

Physical Properties of Some Commercially Available Oxide Materials

Tool Material	Rockwell Hardness, A Scale	Density, Grams per Cubic Centimeter	Transverse- Rupture Strength, Pounds per Square Inch
Ceramic A	86 to 87	3.69	49,000
Ceramic B	91	3.78	69,000
Ceramic C	87 to 89	3.72	61,000
Ceramic D	93 to 94	4.06	80,000
Ceramic E	92 to 93	4.10	
C-7 Carbide	92	10.7	125,000

Note: This data was obtained from physical tests made in the Monarch Laboratory.

carbides. In view of their low heat conductivity, ceramics remain cool even when used at high speeds and are fairly resistant to thermal shock resulting from the use of coolants. However, coolants are not generally employed with ceramic tools.

There is mutual agreement among those in the metalworking industry that the material's low transverse-rupture strength, which is about one-tenth its strength in compression, will have to be improved before the oxides can be considered as a general-purpose tool. Their relatively low transverse-rupture strength necessitates the use of negative rake tools (which place the cutting

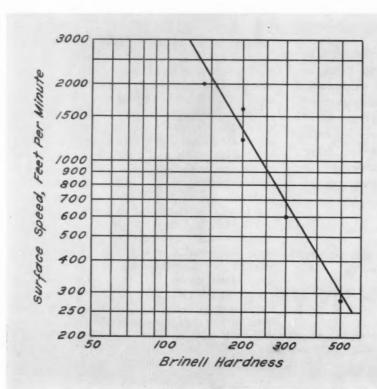


Fig. 1. Relationship between hardness of material to be cut and suggested cutting speed to be employed as a starting point in applying oxide tools.

edge in compression) and automatically limits the chip load during the cut. The physical properties of a number of commercially available oxide tools, as well as a carbide tool, are given in the accompanying table. The properties of each ceramic material vary (even though the major phase is Al_2O_8), depending upon the nature of the bond, density, and metallic additives (copper, nickel, and manganese).

In machining 0.45 per cent carbon steel, present cutting tests indicate that surface speeds of 1400 to 1600 feet per minute can be obtained with the cermet oxide grades containing solid solution alloys as a bonding agent. Practical cutting speeds for the straight ceramic grades, on the same steel, would be under 1200 feet per minute. Using the hardest carbide grades under the same conditions, cutting speeds would be slightly under 1000 feet per minute.

Tooling Requirements

Most of the laboratory tests, as well as those on the production floor, have been made using standard, negative rake tool-holders with a zero side cutting edge angle. The zero lead angle is necessary in most single-point tracing operations.

Experience proved that best results were obtained with the heavier 3/16-inch thick inserts. The inserts were precision ground with a 1/32-inch radius. The use of a larger radius for shaft-turning very often results in chatter, and, in the case of profile work, causes distortion as a result of excessive radial tool pressure.

When tooling with ceramics, it is important that the insert be rigidly supported in the toolholder and free from localized clamping stresses. Any movement of the insert while cutting will result in immediate tool breakage. One problem at present is the difference in size of the precision ground blanks supplied by each manufacturer. In some instances, this factor requires the use of a special tool-holder.

Under light loads, a very good wear pattern, as seen in Fig. 2, is obtained with ceramic tools. When applied to rigid new machine tools, breakage is not a serious problem. Using proper speeds and feeds, wear becomes mainly a function of abrasion. Wear is evidently caused by mechanical breakdown of the oxide grains in tension, so that tool life is determined by the density, bond strength, and crystalline structure of the ceramic body. Fig. 3 illustrates one example of abnormal tool wear. Unlike carbides (which crater severely at high cutting speeds as a result of an alloying effect that occurs at the tool interface), the chemically inert oxide tools show no signs of cratering on their surfaces.

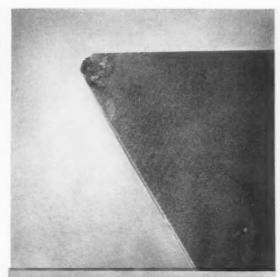


Fig. 2. Normal wear pattern obtained when turning ferrous alloys with ceramic tools. Nose wear was 0.0003 inch after thirty minutes on heat-treated cylinders.

Fig. 3. Abnormal wear of ceramic tool was caused by mechanical breakdown of the oxide grains. Breakage can be noted where chip came in contact with cutting edge.

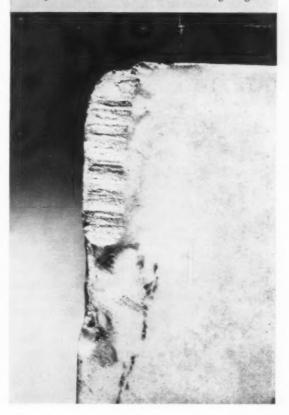




Fig. 4. Equipped with extensive recording instruments, this Monarch Mona-Matic lathe is used to pursue a continuing study of metalremoving problems.

General Applications of Ceramic Tools for Turning

In general, test results have shown that ceramic tools can be best applied to the following turning operations:

1. Finish machining, where the maximum depth of cut is 0.060 inch and the primary concerns are surface finish and accuracy.

2. Finish-turning of heat-treated parts in the hardness range of 26 to 58 Rockwell C.

3. General turning of light alloys, such as aluminum and brass, that have a low unit shear in cutting.

4. Machining of cast-iron parts, providing that there are no surface defects.

5. Turning of abrasive, non-metallic materials such as nylon, Lucite, laminated plastics, and others where high speeds are necessary to obtain the required surface finish.

Most of the test applications of ceramic tools on production machines have been in finishturning operations with high cutting speeds and uniform depths of cut. Within the machining laboratory, on a Mona-Matic test lathe having the necessary horsepower and rigidity, heavier cuts have been taken. This test lathe, illustrated in Fig. 4, is equipped with extensive recording instruments, and an electronic direct-current drive that provides a spindle speed range of 600 to 6000 R.P.M., and a variable feed rate of 0 to 30 inches per minute. For example, in a recent

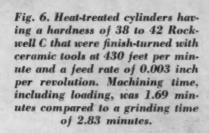
test with a newly developed cermet on AISI 4145 alloy steel, depths of cut of 0.250 inch were made with a feed rate of 0.022 inch per revolution and a cutting speed of 1300 feet per minute. This amounts to a removal rate of 86.0 cubic inches per minute, and the power required to take the cut was 55 H.P.

Cutting tests indicate that oxide tools can be successfully used for tracer-turning operations, providing the tool does not have to plunge into the work. In such applications, the tracer response must be active enough to prevent a dwell at a shoulder. Multiple roughing cuts of varying depth should be made with carbide tools, and the uniform depth finishing cuts, with ceramic tools. Cutting speeds and feeds are critical; therefore, constant cutting speed control is recommended in order to obtain maximum tool performance with the sintered oxide tools. The spindle speeds required to properly use ceramics vary. However, in most instances, top speeds of 2000 R.P.M. appear to be sufficient until improved oxide grades are developed.

As a general rule, cutting speeds for oxide tools are 50 per cent greater than those prescribed for carbides. Feeds are critical and are normally slightly less than those for the harder finishing grades of carbides. In view of high surface speed, chip control is often a problem. Infinitely variable feed, with automatic feed changes, is of advantage in obtaining a broken chip throughout the cycle. Surface finish, even on low carbon steels,



Fig. 5. AISI 4145 steel shaft that was finish-turned at 1200 feet per minute and a feed of 0.0035 inch per revolution with ceramic tools. A finish of 23 microinches was produced.





approaches that obtained in grinding. The actual finish developed depends upon the machine tool, the feed rate used, and the chip action.

Results Obtained with Ceramic Tools in Production

Examples of a number of parts which were turned with oxide tools are illustrated in Figs. 5 to 11, inclusive. They cover a wide range of materials which vary greatly in machinability. Some represent actual production jobs, while others are presented merely to show the future possibility of oxide tools. They all involve finish-turning operations or light machining on clean bar stock. Experience has shown the tools to be unsuitable where they must cut through scale or where intermittent cuts are required.

In machining heat-treated steels, very good results have been obtained at surface speeds of 200 to 600 feet per minute, using light feeds of 0.0035 to 0.006 inch per revolution and a depth of cut

Fig. 7. These valve stems, having a hardness of 58 to 62 Rockwell C, were turned with ceramic tools to illustrate the possible potential of oxide cutting materials.



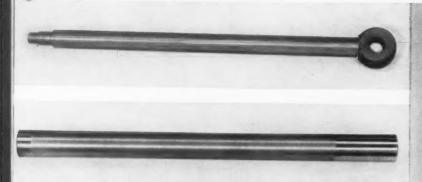


Fig. 8. This piston-rod was finish-turned at 1410 feet per minute, with a feed of 0.0035 inch per revolution and an 0.008-inch depth of cut. The 17-inch long cut was made in 1.50 minutes.

Fig. 9. A good finish can be obtained with ceramic tools even on low carbon steels, as shown on this mechanical tube. A cutting speed of 1800 feet per minute was used for this operation.

of about 0.020 inch. Heavier depths of cut result in excessive tool pressures, which lead to runout and distortion. The results of production tests indicate that good tool life can be obtained even when turning parts having a hardness of 48 to 52 Rockwell C.

A typical example is the pivot shaft shown being machined in the heading illustration. This AISI 1045 steel forging, having a Brinell hardness of 342, was rough-turned on a standard Monarch air tracer lathe, and then finish-turned with ceramic tools on the same machine. The finishing operation was done at 520 feet per minute, with a feed of 0.0045 inch per revolution and a depth of cut of 0.020 inch. The resulting surface finish was 28 to 32 micro-inches. The oxide tool showed only 0.0078-inch flank wear after seventy-five minutes' cutting time. On large parts where grinding is prohibitive due to cost, ceramic tools may be applied to good advantage in eliminating the need for grinding.

Another area where the oxide tools have proved themselves efficient is in the turning of non-metallic parts. Several production operations have been set up for turning plastics, laminates, and powdered metal parts. Cutting speeds on these materials range from 1200 to 2000 feet per minute. Fine feeds are used to prevent tearing of the work surface. In view of the light forces involved, positive rake tools may be used without breakage. Excellent tool life is obtained when turning plastics, powdered metals, and similar abrasive materials.

The brittleness and low impact strength of ceramics restrict their use in turning the high-strength, high-temperature-resistant alloys. Inconsistent results have been obtained when machining titanium; A-286 alloy; 17-7 precipitation hardening stainless steel; and other jet-engine and aircraft alloys. Most of these materials have a shear strength of 100,000 to 160,000 pounds per square inch, which is considerably higher than the transverse-rupture strength of the oxide tools. Rapid breakdown of the cutting edge is obtained in machining such materials, even when light feeds are employed.

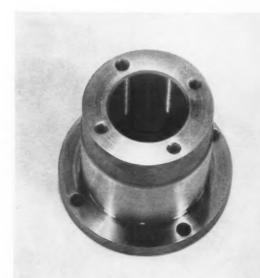


Fig. 10. This heat-treated part, having a hardness of 42 to 45 Rockwell C, was turned with ceramic tools at 180 feet per minute, using a feed of 0.0035 inch per revolution. Tool life was good—twenty-six pieces per cutting edge.



Fig. 11. These bushings were turned to size using oxide tools at exceptionally high speeds. Surface finish was 18 to 23 micro-inches. At top is a laminated non-metallic bushing, and below, a copper-iron powdered metal part.

Summary of Test Results

Test results to date indicate that the oxide tools can do a good job in turning parts to close tolerances at high speeds. They will cut costs and improve production rates, as did carbides when they were applied in place of high-speed steel tools for various metalworking operations.

It is evident that for effective use ceramics must be applied to modern machine tools with sufficient power, high speeds, and extreme accuracy. Education of the tool engineer and operator to the proper use of ceramics will be required. Some shops will have to review their carbide practice before they can hope to begin operations with ceramic tools.

Cooling of Coolant Facilitates Transmission Production

The soluble oil coolant used for finish-boring and milling operations in the production of Buick "Dynaflow" transmission housings is being refrigerated. Sizes must be held to very close tolerances. Any uncontrolled expansion of the aluminum housings would result in excessive waste.

The principal equipment in the system is a 50-H.P. Trane CenTra Vac unit—an automatic hermetic centrifugal water chiller. A portion of oil coolant for the machines is diverted to a heat exchanger, the flow being controlled by a diaphragm valve. In the heat exchanger, chilled water from the refrigerating unit is circulated by a pump, and the soluble oil is cooled. It is then dumped into a sump pit with other coolant.

Three 1220-gallon-per-minute coolant pumps move the temperature-conditioned oil from the pit to the milling and boring machines. Additional cooling is provided at the pit. Oil coolant which prior to chilling is 75 degrees F. leaves the heat exchanger at a temperature of 51 degrees F.

Titanium Alloys Retain Ductility at Very Low Temperatures

Modern metallurgy has shown a great deal of interest in the behavior of metals at very low temperatures. First, there are requirements for welded pressure vessels designed to handle liquid oxygen at a temperature of —321 degrees F. It is known that a number of metals—including some carbon and alloy steels—become embrittled at these temperatures so that an assembly may run the risk of catastrophic failure. Further, metallurgists have learned that a decrease in temperature and an increase in strain rate have a remarkably similar effect, so that in many cases one parameter may be substituted directly for the other.

For this reason, the tests run at Rem-Cru's research laboratory on titanium grades at —321 degrees F. are of high interest. Light, strong, weldable, and corrosion-resistant titanium and several alloy grades offer particular advantages to the designer of guided missiles for liquid oxygen systems.

Graphical Approach for Approximating Arbitrary Gear Ratios

By OTTO LICHTWITZ London, England

ETERMINING the number of teeth in the gears of a gear train that will best satisfy a given speed ratio is a common shop task. The general method for solving such problems appeared on page 162 in September, 1953, Machinery. In that article, entitled "Approximating Arbitrary Ratios with Gears," Charles A. Piper presented a purely arithmetical approach to the calculation of four-gear trains, using continued fractions to find change-gears limited to the range of 20 to 120 teeth. As an aid to the application and understanding of this same general method, a modified semi-graphical interpretation is here presented.

In solving for the best approximation to a given ratio, use is made of a continued fraction such as the following:

$$\begin{array}{c}
1 \\
1+1 \\
6+1 \\
2+1 \\
\hline
1+1 \\
7+1 \\
\hline
6+1 \\
2+1 \\
\hline
\end{array}$$

which may be written, for convenience,

$$\frac{1}{1} + \frac{1}{6} + \frac{1}{2} + \frac{1}{1} + \frac{1}{7} + \frac{1}{6} + \frac{1}{2} + \frac{1}{4}$$

A continued fraction can be terminated at any particular point and evaluated. The quantity so obtained is called a *convergent*.

The value of a continued fraction for a particular convergent may be conveniently computed by means of the following recursion rule:

The numerator of the next convergent is formed by multiplying the numerator of the present convergent by the denominator of the next continued fraction term and then adding the numerator of the previous convergent. To find the denominator, multiply the denominators of the present convergent and next continued fraction terms before adding the denominator of the previous convergent. For example, if the given

continued fraction is terminated at the fifth term (1/7), the successive convergents are:

$$\frac{1}{1}$$
, $\frac{6}{7}$, $\frac{13}{15}$, $\frac{19}{22}$, $\frac{146}{169}$

To solve for the next (or sixth) convergent the recursion rule is used as follows:

$$\frac{(146 \times 6) + 19}{(169 \times 6) + 22} = \frac{895}{1036}$$

Similarly, the seventh and eighth convergents can be shown as being equal to the fractions 1936/2241 and 8639/10000, respectively.

Any given gear ratio may be expressed in the form of a continued fraction. The value of the ratio, if expressed as a decimal, is first converted to fraction form and then expanded in the following manner:

If the ratio 0.8639 or 8639/10000 is expanded

$$\begin{array}{c} 8639 \ \overline{\smash)10000} \ (1 \\ 8639 \ \overline{\smash)1361} \ \underline{\smash)8639} \ (6 \\ \underline{8166} \ \overline{\smash)473} \ \underline{\smash)1361} \ (2 \\ \underline{946} \ \overline{\smash)415} \ \underline{\smash)473} \ (1 \\ \underline{415} \ \overline{\smash)415} \ (7 \\ \underline{406} \ \underline{9} \ \underline{\smash)58} \ (6 \\ \underline{54} \ \underline{9} \ (2 \\ \underline{8} \ 1 \ \underline{)4} \ (4 \\ \underline{4} \ \underline{6} \ \underline{)6} \end{array}$$

the continued fraction

$$\frac{1}{1+\frac{1}{6}} + \frac{1}{2} + \frac{1}{1} + \frac{1}{7} + \frac{1}{6} + \frac{1}{2} + \frac{1}{4} = \frac{8639}{10000}$$

is obtained.

By combining the last few terms of this continued fraction, say the last two, the following equivalent expression results:

$$\frac{1}{1} + \frac{1}{6} + \frac{1}{2} + \frac{1}{1} + \frac{1}{7} + \frac{1}{6} + \frac{4}{9} = \frac{8639}{10000}$$

where

$$\frac{4}{9} = \frac{1}{2} + \frac{1}{4}$$

In order to evaluate the final convergent from an equivalent expression, which includes a combined term such as 4/9, it is necessary to use a modified recursion relation.

If the combined term is considered to be the Nth term, then the numerator of the final (or Nth) convergent is obtained by multiplying the numerator of the (Nth-1) convergent by the denominator of the Nth continued fraction term and adding the product of the numerator of the (Nth-2) convergent and the numerator of the Nth continued fraction term. The denominator of the final convergent is found in like manner. That is, by adding the products formed when the denominators of the (Nth-1) and (Nth-2) convergents are multiplied by the denominator and numerator of the Nth continued fraction term, respectively.

For example, the final term 4/9 in the equivalent expression has the following corresponding convergent:

$$\frac{(895\times9)+(146\times4)}{(1036\times9)+(169\times4)} = \frac{8055+584}{9324+676} = \frac{8639}{10000}$$

This last relation is in the form

$$\frac{895x + 146y}{1036x + 169y} = \frac{m}{n}$$

where 146/169 and 895/1036 are convergents evaluated for the two successive continued fraction terms just preceding the final combined term.

If
$$\frac{x}{y} = \frac{4}{9}$$
 then $\frac{m}{n} = \frac{8639}{10000}$

but by slightly changing the x/y fraction the total value of the continued fraction m/n is also slightly altered. This last relationship is conveniently utilized for finding the closest suitable approximation to any given ratio.

Briefly, the general method consists of first expanding the given arbitrary gear ratio into a continued fraction and then computing the successive corresponding convergents until the numerator or denominator exceeds a certain limiting value. Based on a maximum of 120 teeth per gear, this number is $(120)^2$ or 14,400. By combining the last few terms of the continued fraction and making small changes in this value, a group of rational fractions may be obtained.

In order for a fraction to be suitable, both the numerator and denominator must have two factors within the corresponding gear tooth range of 20 to 120 teeth. The rational fraction that has suitable factors and is closest in value to the original continued fraction represents the best approximation of the given ratio under the limiting conditions of the problem.

Semi-Graphical Method

The semi-graphical approach is also based on continued fractions. After expanding a ratio such as 0.8639, any two consecutive convergents (say 146/169 and 895/1036) are chosen to form a fraction of the type

$$\frac{146x + 895y}{169x + 1036y} = \frac{m}{n}$$

If m/n is a specified fraction, then x and y are solutions of the two simultaneous equations

$$146x + 895y = m 169x + 1036y = n$$

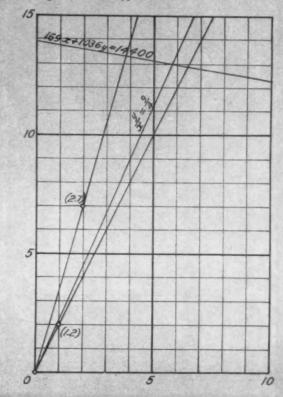
This solution, expressed by determinants, is

$$x = \begin{array}{c|cccc} m & 895 \\ n & 1036 \end{array} & y = \begin{array}{c|ccccc} 146 & m \\ 169 & n \end{array}$$

$$146 & 895 \\ 169 & 1036 \end{array} & 169 & 1036$$

These equations may, of course, be solved without the use of determinants; the chosen form, however, simplifies the explanation. The determinant $\begin{vmatrix} a & c \\ a & c \end{vmatrix}$

Fig. 1. Graphical plot used as a visual aid for determining the best approximation for ratio 0.8639.



is a symbol for (ad-bc). One feature of two consecutive convergents a/b and c/d is that (ad $-bc) = \pm 1$. The denominator in the expressions for x and y will be found to be +1 (in other cases, it may be -1). If m and n are whole numbers, the numerators of x and y are likewise whole numbers. It is obvious that any fraction m/n, close to or far from a required value, can be obtained in this manner when suitable whole numbers are used for x and y.

If the fraction m/n is replaced by the equivalent fraction 2m/2n, the values of x and y are

solute values of x and y are not important, but rather the ratio u/x. Since to each value of m/n there corresponds one value of y/x, it follows that a simple graph-

ical interpretation is possible. As y/x = a constant is the equation of a straight line through the origin of a graph, each fraction m/n can be represented by a line of this description.

doubled to 2x and 2y. This indicates that the ab-

Example 1

In the problem under consideration, the line x = 0 (y-axis) represents the fraction

$$\frac{(146 \times 0) + (895y)}{(169 \times 0) + (1036y)} = \frac{895}{1036}$$

and the line y = 0 (x-axis) similarly represents the fraction 146/169.

The exact value 0.8639 = 8639/10000 is shown graphically as the straight line which satisfies the simultaneous equations

$$\begin{array}{rrr}
 146x + 895y = 8639 \\
 169x + 1036y = 10000
 \end{array}$$

Solving this equation

$$\frac{y}{x} = \begin{vmatrix} 146 & 8639 \\ 169 & 10000 \end{vmatrix} \div \begin{vmatrix} 8639 & 895 \\ 10000 & 1036 \end{vmatrix} = \frac{9}{4} = 2.25$$

It may be stated (without proof) that in any group of straight lines through the origin, the closest approximation to a specified value is represented by that line making the smallest angle with the exact value line.

Since only fractions which consist of numbers smaller than 14,400 need be considered, and as the denominator in this case is larger than the numerator, the limiting condition is reached when

$$169x + 1036y = 14400$$

The corresponding straight line is shown in Fig. 1. The field in which the points with whole-number coordinates are to be explored for suitable approximations may therefore be bounded, at the start, by the line

$$169x + 1036y = 14400$$

the x-axis, and the y-axis, although the latter does not represent a suitable fraction.

Of points with abscissa 1, only the point (1, 2), which represents the fraction

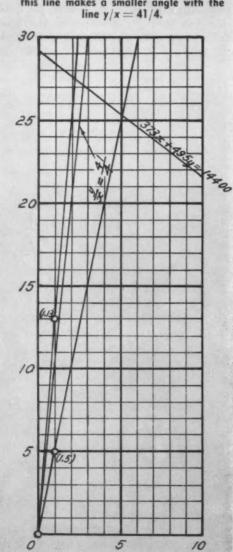
$$\frac{(146 \times 1) + (895 \times 2)}{(169 \times 1) + (1036 \times 2)} = \frac{1836}{2241}$$

will be found suitable. The factors for this fraction are

$$\frac{51 \times 36}{27 \times 83} = \frac{1836}{2241}$$

Therefore, further investigation in the field below the line y/x = 2 can be disregarded. For x

Fig. 2. The closest suitable approximation for the ratio 3.48592 is represented by the plot through the point (1, 13). Note that this line makes a smaller angle with the line y/x = 41/4.



= 2, the points with even ordinates can be disregarded since the resultant fraction can be factored by 2 and thus be reduced to corresponding x=1 values. Hence it is only necessary to investigate points with odd ordinates above the point (2, 4). The point (2, 7) represents the suitable fraction

$$\frac{(146 \times 2) + (895 \times 7)}{(169 \times 2) + (1036 \times 7)} = \frac{6557}{7590} = \frac{83 \times 79}{69 \times 110}$$

Points with ordinates larger than 7 need not be considered, since they cannot lead to a closer

approximation.

The upper limit of the field for further investigation is now restricted by the straight line y/x = 7/2. When investigating points with the abscissas 3 and 4, no further suitable values will be found. As the fraction $\frac{51 \times 36}{27 \times 83}$ involves a smaller error than $\frac{83 \times 79}{69 \times 110}$, it is the best obtainable approximation for the ratio 0.8639.

Example 2

Required ratio is 3.48592. This value can be expanded into the continued fraction

$$3 + \frac{1}{2} + \frac{1}{17} + \frac{1}{3} + \frac{1}{1} + \frac{1}{10} + \frac{1}{4}$$

which has the convergents

$$3,\ \frac{7}{2},\ \frac{122}{35},\ \frac{373}{107},\ \frac{495}{142},\ \frac{5323}{1527},\ \frac{21787}{6250}$$

If the two convergents 373/107 and 495/142 are arbitrarily selected, the line for the exact value has the equation

$$\frac{y}{x} = \begin{vmatrix} 373 & 21787 \\ 107 & 6250 \end{vmatrix} \div \begin{vmatrix} 21787 & 495 \\ 6250 & 142 \end{vmatrix} = \frac{41}{4}$$

as shown in Fig. 2.

The upper limit is determined by the requirement that the numerator must not exceed 14,400, so that its equation is

$$373x + 495y = 14400$$

Proceeding in the manner described above, the two nearest lines representing values with suitable factors are those connecting the origin with the points (1, 5) and (1, 13). The latter involves the smaller error. The best solution therefore is

$$\frac{(373\times1)+(495\times13)}{(107\times1)+(142\times13)} = \frac{6808}{1953} = \frac{92\times74}{31\times63}$$

Example 3

Closest approximation to the value 0.7348 is desired. The continued fraction is

$$\frac{1}{1} + \frac{1}{2} + \frac{1}{1} + \frac{1}{3} + \frac{1}{2} + \frac{1}{1} + \frac{1}{3} + \frac{1}{4} + \frac{1}{3}$$

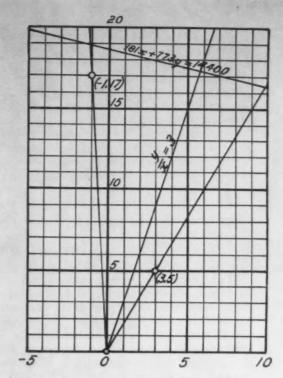


Fig. 3. The line through point (3, 5) indicates that the suitable factors $\frac{79 \times 41}{58 \times 76}$ will give the closest approximation to the ratio 0.7348.

and the corresponding convergents are

$$1,\,\frac{2}{3},\,\frac{3}{4},\,\frac{11}{15},\,\frac{25}{34},\,\frac{36}{49},\,\frac{133}{181},\,\frac{568}{773},\,\frac{1837}{2500}$$

For the purpose of comparing the results with those of the previous article, the two convergents 133/181 and 568/773 are chosen. Then the line for the exact value is given by the equation

$$\frac{y}{x} = \begin{vmatrix} 133 & 1837 \\ 181 & 2500 \end{vmatrix} \div \begin{vmatrix} 1837 & 568 \\ 2500 & 773 \end{vmatrix} = \frac{3}{1} \text{ (Fig. 3)}$$

The upper limit is now formed by the straight line

$$181x + 773y = 14400.$$

If only the right top quadrant is investigated (i.e. both x and y have positive values), the best approximation is found on the line that passes through the point (3, 5) and which represents the fraction

$$\frac{(133 \times 3) + (568 \times 5)}{(181 \times 3) + (773 \times 5)} = \frac{3239}{4408} = \frac{79 \times 41}{58 \times 76}$$

However, no suitable point will be found above the line representing the exact value. When the search is extended to points with negative abscissas, the line through the point (-1, 17) proves to represent a good approximation. In the case under consideration, the fraction represented by the point (3,5) is superior, but there may be cases where the straight line for the better approximation lies in the left top quadrant. If the purely arithmetical method is applied, it is scarcely to be expected that -17/1 should be chosen as an approximation to 3/1. It should also be noted that once a line representing a suitable value is found, points located on lines through the origin that make a greater angle with the exact value line need not be considered.

Actually, this is only a graphical representation of an arithmetical procedure, and after some practice the graphs can be visualized so clearly that it is possible to work again on a purely arithmetical basis. A systematism can be achieved which would hardly have been possible without the detour over the graphical method.

A further advantage of this procedure is that it permits marking off points already investigated, and calculating can therefore be readily interrupted and resumed. The graphical method can be conveniently applied if the error tolerance is specified, the search being started in the area having points that comply.

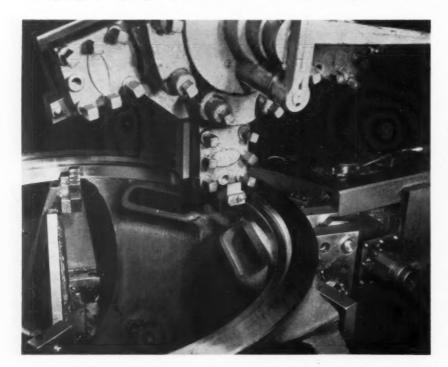
Heavy-Duty Performance by Indexable "Throw-Away" Insert Cutters

Machining of work-pieces made of cast armor steel requires tools that are capable of withstanding severe service. In the illustration, heavy-duty, Kendex indexable "throw-away" button inserts, manufactured by Kennametal, Inc., Latrobe, Pa., are being used to machine a cast armor steel part in a Bullard vertical turret lathe. These work-pieces have a Brinell hardness of 280 to 300 and are harder still in areas that have been chilled during cooling.

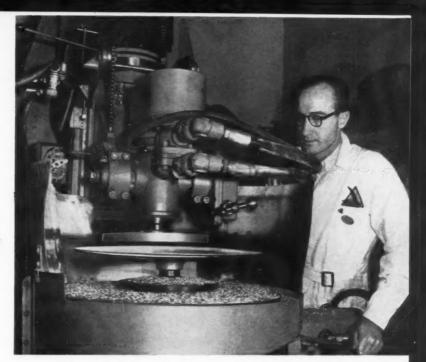
In this application, two castings are rough machined or six pieces finish machined with each cutting edge. Roughing cuts of 1/4 inch to 7/16

inch are taken with a feed of 0.015 inch and cutting speed of 270 surface feet per minute.

When roughing the shoulder and face, a rectangular insert with four cutting edges is indexed so as to machine eight pieces. Parallelogramshaped inserts are interchanged between the rough-turning and boring operations to make use of the four cutting edges on each insert. All finishing cuts are made with parallelogram inserts that produce twenty-four pieces when all four cutting edges are employed. The depth of a finishing cut is 1/32 inch, using a speed of 250 surface feet per minute and a feed of 0.015 inch.



This part, made of cast armor steel, is machined with tools having heavy-duty indexable throwaway inserts. Four cutting edges are provided on each insert to increase tool output.



By Dr. P. H. TAYLOR
Chief, Engineering Optical Laboratory
Northrop Aircraft, Inc.
Pasadena, Calif.

Probing into Space Made Possible by SHATTERING THE INCH

Northrop Aircraft, Inc., shave the inch into a million parts and, by similar ultra-precision techniques, split light beams with optical wedges. Items that the laboratory has either produced or is capable of producing include large objectives, or mirrors, for astronomical observatories; optics for the SM-62 Snark intercontinental missile; photographic lenses; master wedges whose angles can be held to about 1/2 second of arc; and master flats whose surfaces do not depart from a true plane by more than one-millionth of an inch. A cross-section of the type of work done at the laboratory is shown in Fig. 1.

Optical wedges are employed to split light beams so that a single image may be viewed from more than one source. To insure the blotting out of unwanted rays of light, the wedges are coated with Luxorb, a company-developed substance that absorbs light as a sponge soaks up water. As a result, the images are clearer and enable the astronomer to peer further into the reaches of space.

The work performed at the optical laboratory is not gaged by ordinary precision standards but is reckoned in terms of light fringes. One light fringe is equal to 0.000011 (eleven millionths) of an inch. Many of the astronomical instruments

being manufactured are held within a tolerance of one-tenth of a light fringe, or 1.1 millionths of an inch, in 10 inches. Although these extreme tolerances can be achieved by tedious manual means, Northrop optical specialists and engineers have developed machinery to speed the production of precision optical parts.

"Refractoform" Grinding Machine

One of these developments, called the "Refractoform" grinding machine, was invented by Warren E. Ashenfelder, Robert P. Johnson, and Nathan Wilcox. It can be seen in the heading illustration. With this high-speed grinding machine, work that formerly required thirty-three manhours can be accomplished in seven minutes. It is being manufactured under license by the Keystone Engineering Co., Los Angeles, Calif.

The name "Refractoform" has been selected for the machine because of its versatility in the precision grinding of any spherical, aspherical, or optically flat components, or any other form that is a surface of revolution. Dimensions are closely controlled by the operator, thereby enabling the machine to carry through more nearly to the polishing stage than any standard equipment. Although finish-polishing can also be handled, it is



Fig. 1. An array of optical components being produced for use in astronomical observatories, the SM-62 Snark intercontinental missile program, and other similar applications. They include concave and convex mirrors; lenses; optical flats; prisms; and optical wedges.



more economical to perform the final operation on conventional optical equipment. However, polishing masters—cast-iron forms that are accurately ground to the desired curvature of the forms to be lapped—can be generated accurately and quickly. Cast-iron tools that are used for correcting the pitch of the polishers can be generated flat, convex, or concave to an accuracy of 3 light fringes.

Work-pieces ranging in diameter from 1 to 40 inches and having a vertical height up to 10 inches are within the capacity of the machine. Two hydraulically operated feed tables and one manually operated feed table are provided. The longitudinal table hydraulically feeds the work past the cutting wheel for surface grinding and generating. The transverse table is manually operated and provides cross-feed and cutting adjustment. A rotary table is driven by a high-pressure hydraulic system and incorporates a vacuum type mounting base.

The vacuum chuck consists of a polished perforated plate and a flanged neoprene gasket that grips the work-piece tightly when vacuum is applied. A large blank for an optical flat can be seen held in place by the vacuum chuck in Fig. 2. A cup-shaped cutting wheel is being positioned for grinding.

Both glass and metal can be formed by the machine. In the heading illustration can be seen a fly-cutting attachment being used to shape a metal backing-plate that is used for polishing a concave mirror. The contour of the work for non-spherical surfaces is controlled by a template follower mounted on the end of the main lead-screw of the hydraulically actuated ram. Contours for spherical surfaces can be maintained throughout a range of 135 degrees. The ram, which has an 11-inch travel, is actuated by a low-pressure hydraulic system and feeds in increments ranging from 0.0005 to 0.010 inch.

A separately housed power unit supplies hydraulic pressure to the grinding machine. Within the unit, a 30-H.P. electric motor drives a high-pressure pump (2000 pounds per square inch) on one side and a low-pressure pump (200 to 500 pounds per square inch) on the other side. A smaller pump unit furnishes the vacuum for the work-holding chuck.

A safety feature of the machine will halt operation if, for any reason, the vacuum system

Fig. 2. Preparing to grind a large optical flat on a "Refractoform" grinding machine. It can be used to generate any optical surface of revolution. The rotary table features a vacuum type work-holding plate.

fails. In that case, hydraulic fluid will bypass the worm gear drive of the table and spindle and return to the sump tank. Due to the inertia of the mechanism, the table will come to a halt after a few revolutions. Another feature of the installation is a walk-in pit beneath the machine that facilitates inspection and maintenance of the hydraulic system and periodic reading of strain gages on which the machine sits.

"As Smooth as Glass"

The common term "as smooth as glass" is very misleading. Ordinary window glass will yield an interferometer pattern much like the smoky waves in a glass marble, whereas a perfect optical flat will show nearly straight lines across its entire surface when viewed in an interferometer—an optical comparator gage that produces measurements precise to a fraction of a light wave.

Delicate hand-finishing is necessary to bring the parts to the last millionth of an inch precision. Technicians shown in Fig. 3 put the finishing touches on optical components. A moist polishing compound, generally called rouge, is applied to a metal lapping plate that has been coated with pitch. The part is then delicately lapped by hand with a circular motion. At the same time, the technician circles the plate constantly in what is called "the optician's gandy dance." Once the lapping operation is started, the rouge used as a polishing agent must be kept damp to prevent freezing of the glass to the pitch.

Millionth-of-an-inch accuracy can be seen in progressive stages of completion in the composite illustration in Fig. 4. These views were taken through an interferometer. In the upper view, the flat has been polished until it is as accurate as the best steel precision gages. However, it distorts the refractory image of a pin point of light into the form of a Maltese cross, as can be seen at the right.

The same optical flat shows an improvement in the center view, which is at a later polishing stage. The refractory image now resembles the planet Saturn. In the bottom view can be seen the completely polished flat yielding light fringes in the form of straight lines and a refractory image of the pinpoint of light in the form of a perfect circle. As previously mentioned, the light fringes shown on the test part are 0.000011 inch apart.

Fig. 4. Composite illustration taken through an interferometer, showing an optical flat in progressive stages of completion. A straight-line refractory pattern (bottom view) indicates a completely polished optical flat.



Fig. 3. Final precision of optical components is achieved by delicate hand-finishing methods. Jeweler's rouge is dusted on a pitch-coated lapping plate and moistened. The plate is then gently lapped with a circular motion until a perfect finish is achieved.



How to Classify Employes for Overtime Exemption

It's the type of work done, rather than the individual title, that counts. The rules governing the exemption of certain categories are given in simplified form.

> By ROBLEY D. STEVENS Management Consultant Washington, D.C.

MPLOYERS engaged in the manufacture of metal products should avoid assuming that an employe is either entitled to or exempted from overtime pay on the basis of his title or salary. In substance, the Fair Labor Standards Act states that, with certain exceptions, anyone employed by a firm manufacturing metal products and engaged in interstate commerce must receive overtime pay for work beyond 40 hours per week.

The question is, who in your organization—engineering and production—is covered and who is not? It can only be settled by comparing the official simplified "tests" of duties, responsibilities, salary, and other basic requirements for eligibility to the job functions of each individual worker. The language of these wage-hour "tests" is exclusionary; that is, anyone in your organization whose job measures up to all the requirements is not officially entitled to overtime, but is exempted from the regulations.

Employes are not exempted because they have impressive titles or are paid a good salary. In brief, for the exemption to apply, the individual's duties should meet a series of tests laid down by the wage-hour law regulations. Three classifications of exemptions are here presented.

1. A manufacturer of metal products executive is one: (a) whose primary duty is the management of the establishment or a recognized department; (b) who regularly directs the work of at least two full-time employes; (c) who can hire or fire, or recommend hiring or firing, or whose suggestions in regard to hiring or firing are given particular weight; (d) who regularly exercises discretionary powers; (e) who devotes no more than 20 per cent of his work-week to non-exempt work; and (f) whose salary is at least \$55 a week.

For quick reference the following applicable short test may be used: An executive who earns

at least \$100 per week is *exempt* if (a) he regularly directs the work of at least two full-time employes and (b) his primary duty is management of the establishment or a department.

2. A manufacturer of metal products company administrative worker is one: (a) whose primary duty is responsible office or non-manual field work of substantial importance to management or operation of the business; (b) who customarily and regularly exercises discretion and independent judgment, as distinguished from using skills and following procedures. He must have the power to make important decision; (c) he must spend no more than 20 per cent of his work-week on non-exempt work, that is, work not closely related to his administrative duties; and (d) he must earn at least \$75 a week in salary.

The following *short test* may be applied for quick reference: An administrative employe who earns at least \$100 a week is *exempt* if (a) his primary duty consists of responsible office or non-manual field work of substantial importance to management or operation of the business; and (b) his work requires the use of discretion and independent judgment.

3. A professional worker in a firm that manufacturers metal products is one: (a) who consistently exercises discretion and judgment; (b) who does work that is mainly intellectual, as distinguished from routine or mechanical duties; (c) who spends no more than 20 per cent of his work-week on activities not closely related to his professional duties; and (d) who earns at least \$75 a week in salary or fees.

The *short test* for this category is as follows: A professional employe who earns at least \$100 a week is *exempt* if his primary duty is learned professional work which requires consistent discretion and judgment or his primary duty is

artistic professional work that requires invention, imagination, or talent.

In brief, to be considered for the exemption as a "professional," the employe's work must require advanced knowledge in a field of science or other branches of learning, usually obtained by a long course of specialized intellectual instruction at a college or university. However, the mere possession of a degree does not automatically exempt the worker.

Examples

Equally important to understand is that the primary purpose of the exclusionary language—placing a limitation on the amount of non-exempt work—is to distinguish between the bona fide executive and the working supervisor who regularly performs production work or work only remotely related to the supervisory activities.

One type of working supervisor most commonly found in industry works alongside his subordinates. Such an employe, sometimes known as gang or group leader, performs the same kind of work as that performed by his subordinates and also carries on supervisory functions. Hence, the work of the same nature as

that performed by the subordinate should be counted as non-exempt work and, if the amount is substantial, the exemption could not be used.

For example, a supervisor or foreman who operates a machine in the manufacture of metal products necessary to production is considered performing non-exempt work. But this should not be confused with the operation of a machine by a supervisor or foreman to instruct his subordinates in the manufacture of metal products, before going into production.

There is no doubt that the head bookkeeper who spends a substantial amount of his time keeping books of the same general nature as those kept by other bookkeepers—even though his books are confidential in nature or cover different transactions from the books maintained by the under bookkeepers—is not primarily an executive employe and, under the rules laid down, should not be so considered.

An office manager who does not *supervise* two or more employes would not meet the requirements for exemption as an executive employe but may possibly qualify for exemption as an administrative worker.

It is necessary to emphasize the fact that the federal wage-hour regulations do not exempt

U. S. DEPARTMENT OF LABOR WAGE COMPUTATION AND TRANSCRIPTION SHEET Pay roll or card No. Name of employee Address Form FO-55 is used by Establishment U. S. Department of Labor for obtaining Address extensions, recompu-Contract Nos. (PCA). tations, or transcriptions of an employe's wages. Amount due for weeks indicated above Investigator Computed by Reviewed by.

all employes of professional employers, or all employes in industries having large numbers of professional workers, or all employes in any particular occupation. For example, they do not exempt persons with professional training who are working in professional fields. The field of engineering has many persons with the title of "engineer" who are not professional engineers, as well as many who are trained in the engineering profession, but are actually working as trainees, junior engineers, or draftsmen.

It is natural for engineers working in the metal products manufacturing industry to *prefer* to be classified as professional workers and to be a part of the management team—most of them are. However, it is not enough to be considered an executive, administrative, or professional worker in title alone. The job performance must meet all tests laid down by the wage-hour regulations for exemption. In brief, job titles are insufficient as yardsticks for exempting any individual worker from overtime pay after a 40-hour week.

Your company should keep in mind that these requirements apply to employes who are engaged in interstate commerce or in the production of goods for interstate commerce, including occupations closely related and directly essential to such production. The interstate activities of most manufacturers of metal products bring their employes within the scope of the federal wagehour law. However, any one of the foregoing workers can be sure that he is qualified for exemption by answering "yes" to the series of tests mentioned above.

Record-Keeping

As executive, administrative, and professional workers become available to your company, a foundation is laid for keeping certain time and pay records, which every employer in the metal products industry must do under the federal wage-hour law. But, no particular form or order is required.

It is pertinent to keep in mind that, based on past experience, the wage-hour records here listed should be kept for inspectional purposes. An investigator's first contact with an employer is through an audit of the records. Inaccurate or incomplete records could prove costly.

You Need These Facts to Prove Your Claims

A simplified breakdown of the identifying information that should be in your records follows:
(a) employe's full name; (b) his home address;
(c) his social security number; (d) the occupa-

tion in which he is employed; (e) time of day and day of week his work-week begins; (f) total hours worked weekly; (g) basis on which wages are paid; (h) legal deductions from wages paid; (i) total wages paid each pay period; and (j) date of payment and pay period covered by payment.

Other Pointers

If this list of record-keeping appears to involve a lot of information, remember that most of it is required by the wage-hour regulations. However, in the interest of sound management practice, these records should be kept.

Undoubtedly, many workers are on a fixed working schedule. In that case, the employer should keep a record showing the exact number of daily and weekly hours that the individual worker is expected to follow.

All records should be kept for three years except those on which wage and hour computations are based. These items, which include time cards, wage-rate tables, worktime schedules, additions and deductions from wages, and including order, shipping and billing records should be kept for two years.

Naturally, records must be open for official inspection because an investigator may request your company to make extensions, recomputations, or transcriptions, as indicated on the illustrated Form FO-55. It appears to be a sound dollars-and-cents proposition for manufacturers of metal products to comply with wage-hour rules.

The expanded coverage of the federal wagehour law is strikingly pointed out by the fact that an employer in this industry may subject himself to litigation, criminal actions, or wage suits brought about by an executive, administrative, or professional worker not found officially exempted. Also, double damages are a probability for the alleged back wages found due by the inspector.

Tips or complaints may arise from many sources—competitors, labor unions, employes, and ex-employes. Aside from this, however, is the fact that a *re-inspection* may occur at any time.

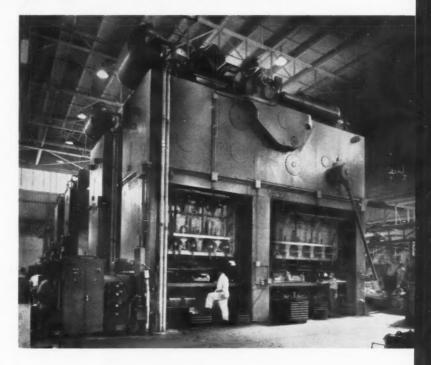
Overtime is expensive enough without making it more so by *misclassification* of employes. The solution to this problem indicates that each manufacturer of metal products must of necessity work out his own system of compensation.

The above pointers are important and should be considered when qualifying workers for the exemption status. It is obvious from all this that both employer and employe alike owe it to themselves to have a working knowledge of the wagehour exemption rules.

Transfer Presses Are Self-Contained

Production Lines

By MELVIN D. VERSON
Vice-President
Verson Allsteel Press Co
Chicago, III.



HEN production requirements are high and unit costs must be held to a minimum, automatic transfer pressworking is one solution. For example, if production of a part requires four or more operations and demand is 4000 or more pieces per day, an automatic transfer press such as the Verson Transmat offers opportunities for cost reduction.

These presses have been built in capacities as small as 100 tons and as large as 4000 tons. Design refinements include turn-over devices between operations, automatic applications of stock lubricant, automatic feeding, and double-blank detection.

Depending upon the part being produced, either developed blanks can be fed or coil stock, which is blanked in the first operation, can be used. Because automatic transfer fingers move the work-pieces through the entire sequence of operations, the need for a carrying strip is eliminated, thus reducing friction within the die area. Blanks can actually be made to overlap one another which leads to the minimizing of scrap loss. Annealing and pickling of stampings between drawing and redrawing operations is eliminated in a press of this type, because the stamping moves from one set of dies to the next in just a few seconds so that the metal does not have time to cool. Automatic, delayed-action, ad-

justable-stroke knock-out cylinders at each station prevent damage to piece parts by positive stripping and location.

Two 2200-ton capacity, two-slide Transmat presses are presently in service producing right and left front-end suspension parts for a major automobile manufacturer. Having a variable-speed drive covering a range of ten to twenty strokes per minute, these presses, one of which is shown in the heading illustration, can each produce 800 parts per hour. The right-hand slide (left-hand side of the illustration which shows the rear of the press) has a rated capacity, near the bottom of the stroke, of 1000 tons. Within this die area are four operating stations. Area measurements of the slide and bolster are 54 inches front-to-back and 112 inches right-to-left.

In the space between the center columns is a turn-over device that automatically grasps the piece part, turns it over, and deposits it in position for forming at the next station in the left-hand die area. The capacity of the left-hand slide, near the bottom of the stroke, is 1200 tons. Area measurements of the bolster and slide, which stretch across six operating stations, are 54 by 168 inches. Each operating station is equipped with combination pneumatic and positive safety cross-bar knockouts.

Stock for the front-end suspension members

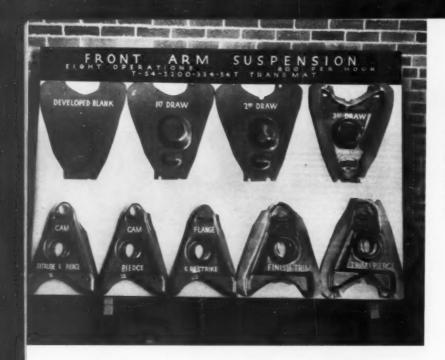
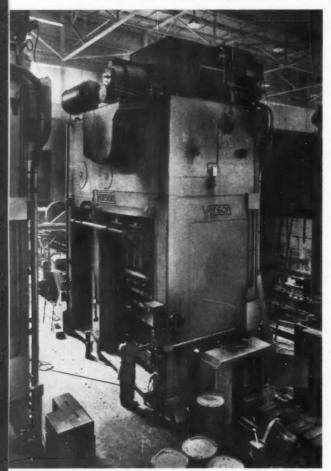


Fig. 1. Sequence of operations performed in the production of automotive frontend suspension members. The parts are completely formed in the 2200-ton capacity transfer press shown in the heading illustration.

Fig. 2. Eleven-station, multiple-slide transfer press being used to produce banjo type rear-axle housings. The press is completing the 0.156-inch thick steel parts at a rate of 800 per hour.



is pre-blanked and placed on a conveyor which transfers it into position beneath an automatic stack feeder. Without interrupting production, the device feeds the individual 1/8-inch thick steel blanks into the first station. In the event that two blanks are fed simultaneously, a safety blank detector automatically stops the press before they reach the first die, thereby protecting the equipment from damage. Individual, manually adjustable slides at each station provide accurate die alignment and adjustment.

A pair of mechanically actuated feed-fingers grip the blank and move it into the first die station where a drawing operation is performed. As the slide ascends, another pair of feed-fingers move in, grip the piece, and move it to the next station. The part is then located in position, and the fingers are retracted as the slide descends. A second and third draw take place at this and the following station.

Moving to the fourth station, the first, or partial, trim is made, and the center hole is pierced. Scrap drops into a chute that directs it to tote boxes located on both sides of the press. The part is then fed into the turn-over device where fingers grasp it, turn it over, and feed it to the seventh station. A finish trim is made at this point.

At the eighth station, the piece part is flanged and restruck while the ninth station is left idle to allow for die clearance and any future alteration of part design. The tenth station campierces; the next station is idle, again for die clearance; and the final operation extrudes and pierces. Each step in the shaping of this part, which measures 15 3/8 by 19 3/4 inches with a draw depth of 3 1/4 inches, can be seen in Fig. 1.

Fig. 3. Banjo housings are shown after each of six forming operations performed on the developed blank at the left. The blanks receive a film of drawing compound as they pass between rollers and enter the first die station.



A double-roller arrangement automatically applies drawing compound at the required die stations. In the interest of safety, stop-button controls are located at convenient places on all sides of the press.

Banjo type rear-axle housings for automobiles are being produced on another 2200-ton capacity, multiple-slide Transmat press, Fig. 2. As was the case with the first machine, the press is equipped with a variable-speed drive providing a range of ten to twenty strokes per minute and yielding a production rate of 800 parts per hour. The press incorporates a mechanically actuated, direct gear-driven feed mechanism.

Developed blanks, 0.156 by 8 by 20 1/2 inches, are transported along a conveyor to the stack feeder where they are automatically loaded and fed into the press. The conveyor and developed blanks can be seen in the lower right-hand corner of Fig. 2. Capacity of the ram in the right-hand die area, which contains six operating stations, is 1000 tons, with dimensions of the bed and slide area being 72 by 108 inches. Between the columns are two non-operating stations. The left-hand die area contains three operating stations and has a ram capacity of 1200 tons. Bolster and slide measurements are 72 by 54 inches.

As the blanks are moved from the stack feeder into the press, the automatic safety blank detector checks for double blank thicknesses. Drawing compound is applied as the blanks pass through a double roller arrangement while proceeding into the first station. At this point a flange is formed on the sides of the blank to an angle of 90 degrees. In the second station the flange is re-formed to a 45-degree angle and is later flattened against the part in the third sta-

tion. The next position is idle to accommodate tooling in the fifth station where the part is formed in the shape of a "U" on its longitudinal axis. In the sixth station, the housings are finishformed and offset. The seventh and eighth stations are non-operating as the part passes between the columns. Restriking is the final operation and is done with the tooling centered beneath the ram in the tenth station—leaving both the ninth and eleventh stations idle. The complete sequence of operations can be seen in Fig. 3.

In still another automotive plant, automatic mass production of covers for transmission converter pumps is being performed at the rate of 1000 covers per hour on a 3000-ton capacity Transmat press. This press operates at a fixed speed of 20 strokes per minute.

The right-hand slide is of 1600 tons capacity, with bolster and slide areas measuring 60 by 160 inches. There are eight operative stations in this die area. A turn-over device has been installed and occupies the two inoperative stations located between the columns. The left-hand slide, with 1400 tons capacity, has an area of 60 by 60 inches and contains three operating stations.

Two individual feed mechanisms are supported on a carriage for side-by-side mounting of both a coil feeder and a stack feeder. The carriage is rail-mounted to facilitate moving either unit into position, depending on the job to be done. By means of a push-button, the carriage is electrically and mechanically interlocked to the press and ready for feeding.

For production of the pump covers, the stack feeder is used. The unit has three stations—two stations may be loaded with blanks while the

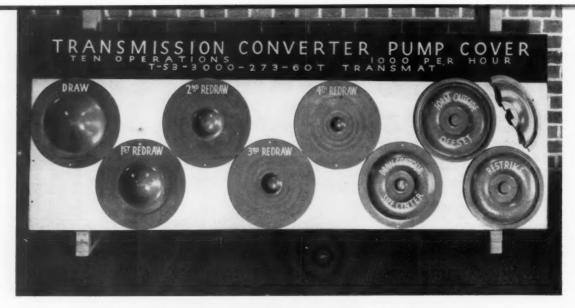


Fig. 4. Nine operations on a 3000-ton capacity multiple-slide transfer press were required to form this pump cover. The ninth step, in which twenty-four holes are pierced, is not represented.

third station is feeding the press. As one station is unloaded into the press, the next will move into position to be ready for feeding.

A safety blank detector is provided to prevent double blanks from being fed into the first die station. As the mechanically actuated feed-fingers grip the blank, it is moved to the first die where a draw is made. The effect of this first step on the blank can be seen on the left-hand side of the display board shown in Fig. 4.

At the next four stations, subsequent redraws are made on the part. The seventh station is idle while the eighth operation draws the contour and sizes the center. In the following station, the offset around the perimeter of the part is formed.

The part is then moved between the press columns into the turn-over mechanism. Here, fin-

gers grasp it and deposit it in a reversed position into the left-hand die area for the final three operations. In the eleventh station, the outer edge is trimmed and the scrap drops into chutes leading to tote boxes. A restrike operation follows in the twelfth station, and in the final station twenty-four holes are pierced. Formed from 0.224-inch thick steel, the finished part has a diameter of $13\ 1/4$ inches with a draw depth of $1\ 1/4$ inches. The parts shown in Fig. 4 represent each step in the press sequence with the exception of the edge trimming and hole piercing. A cutaway component shows the configuration.

Improved Deburring Tools Finish More Holes

Use of a revised type of deburring tool has resulted in considerable savings at the Aircraft Engine Division of Ford Motor Co., Chicago, Ill.

The revised tool has a cutting edge formed by a hole through the 90-degree tapered body, as seen in the accompanying illustration. This single edge is free-cutting and chatterless. Previously, deburring of holes was done with the use of ball-shaped, vitrified, mounted points and air guns. One deburring tool will finish about 3000 holes before it becomes necessary to resharpen it. Also, only one size tool is required to accommodate a range of holes varying in diameter from 3/16 to 9/16 inch.



Deburring tools having cutting edges formed by holes through the 90-degree tapered bodies.

Practical Parts Numbering System

By E. H. BRUCE Kearney & Trecker Corporation, Milwaukee, Wis.

N ideal parts numbering system can be followed, unamended, for a substantial period of time. It should also be simple, flexible, and adaptable to any type of product. A system that has all of these important requisites

Trecker Corporation, Milwaukee, Wis., for a period of many years.

Basically, numbers with six characters-000001 to 999999-are employed. By adding a prefix, the designations 1-0001 to 1-9999, and 2-, 3-, up to has been in continuous use at the Kearney & 9-0001 to 9-9999 are included. This arrangement

Unit Number	Name		Used With	
5186	Coolant P			
5187	Coolant Pump			
5188	Electrical Control	*** \ \$7 .		
	Precision Stop (Single Pos			
5189	Precision Stop (Four Posi			
5190	Auto. Draw Bar (Horiz. t			
5191	Rear Control on Knee (H	oriz.)		
5192	Vert. Head			
5193 5194	Arbor Support			
5195	Arm Brace			
5196	Arbor Support (Intermed: Complete Machine for the			
5197				
5198	Complete Machine for th	e vert.		
5199	Complete Machine for th			
5200	General Assembly Compu		Model 2D Rotary Hd. Mill. Mach.	
5200	Electrical Equipment (Re Complete Machine for 41		Model all Hotary Ho. Man. Mach.	
5202	Speed Gear Box with Aut		18, 24 AC & 2CH	
5203	Column	Plain	10hp No. 2TF Automatic Cycle	
5204	Column	Vert	10hp No. 2TF Automatic Cycle	
5205	Knee	Plain, Vert.	10hp No. 2TF Automatic Cycle	
5206	Feed Distribution Box	Plain, Vert.	10hp No. 2TF Automatic Cycle	
5207	Rear Control Bracket	Plain, Vert.	10hp No. 2TF Automatic Cycle	
5208	Table Drive Bracket	Plain, Vert.	10hp No. 2TF, 15hp No. 3TF AC	
5209	Plain Saddle	Plain, Vert.	10hp No. 2TF Automatic Cycle	
5210	Control Valve Body	Plain, Vert.	10hp No. 2TF, 15hp No. 3TF AC	
0210	Control varie body	A min, vere	25hp No. 5TF, 25/50hp No. 5TFC AC	
5211	Table	Plain, Vert.	10hp No. 2TF Automatic Cycle	
5212	Arm Brace	Plain	10hp No. 2TF Automatic Cycle	
5213	Column	Plain	15hp No. 3TF Automatic Cycle	
5214	Column	Vert.	15hp No. 3TF Automatic Cycle	
5215	Knee	Plain, Vert.	15hp No. 3TF Automatic Cycle	
5216	Feed Distribution Box	Plain, Vert.	15hp No. 3TF Automatic Cycle	
5217	Rear Control Bracket	Plain	15hp No. 3TF Automatic Cycle	
5218	Plain Saddle	Plain, Vert.	15hp No. 3TF Automatic Cycle	
5219	Table	Plain, Vert.	15hp No. 3TF Automatic Cycle	
5220	Arm Brace	Plain	15hp No. 3TF Automatic Cycle	
5221	Column	Plain	25hp No. 5TF Automatic Cycle	
5222	Column	Vert.	25/50hp No. 5TFC Automatic Cycle	
5223	Knee	Plain, Vert.	25hp No. 5TF, 25/50hp No. 5TFC AC	
5224	Feed Distribution Box	Plain, Vert.	25hp No. 5TF, 25/50hp No. 5TFC AC	
5225	Rear Control Bracket	Plain	25hp No. 5TF Automatic Cycle	
5226	Table Drive Bracket	Plain, Vert.	25hp No. 5TF, 25/50hp No. 5TFC AC	
5227	Plain Saddle	Plain, Vert.	25hp No. 5TF, 25/50hp No. 5TFC AC	
5228	Table	Plain, Vert.	25hp No. 5TF, 25/50hp No. 5TFC AC	
5229	Arm Brace	Plain	25hp No. 5TF Automatic Cycle	
5230	Boring Head		3 & 4C Machines	
5231	Speed Drive		3 & 4C Machines	
5232	Feed Box		3 & 4C Machines	
5233	Electrical Equipment		3 & 4C Machines	
5234	Column		3C Machine	
5235	Column		4C Machine	

Fig. 1. Unit assembly designations are assigned from this master unit list in the order required.

allows a total of 1,089,990 individual identification symbols without incorporating a seventh figure. Prefixed numbers are filed with the corresponding four figure numbers; for example, the numbers 3000, 1-3000, and 2-3000 are all filed together.

Unit numbers, taken from a master unit list (Fig. 1), are assigned to each unit assembly. Prefixed with the letter *U*, these designations identify lists of both purchased and manufactured parts. This method is convenient since units are sometimes applicable to more than one machine.

Part numbers are drawn from a master parts book, as illustrated in Fig. 2, in the order requested by the draftsman, regardless of the machine or attachment involved. A parts list, Fig. 3, is made for each unit assembly, with purchased parts placed on a separate stock parts list. For general reference, a master record is made of each part number issued.

With suffix letters added for components such as screws S, nuts N, keys K, washers W, springs

SG, and cutters Z, separate master part lists are easily kept for each of these items. Data sheets, as shown in Fig. 4, guard against part duplication. Purchased components are handled in a similar manner. An index for the data sheets of all standard parts is maintained and distributed to all departments concerned with such commonly used equipment.

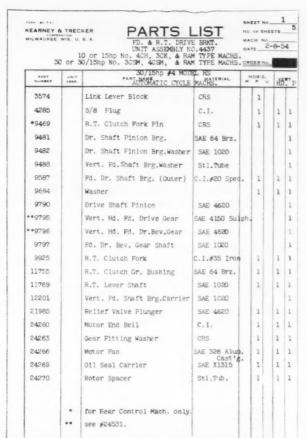
Once assigned, a component designation is retained throughout all minor modifications. However, if the part is in any way made unsuitable for previous lots, the number is changed, and a new drawing is issued. In this way many complications are avoided.

Experimental, special, and new machine parts are given numbers prefixed with an EX, S, or M, respectively. But as these units go into production, the components are reassigned standard part numbers that are acquired as necessary from the master list.

Whenever a lot is to be manufactured, unit assemblies are drawn from stock as required by the unit list for the machine. If an assembly is

Fig. 2. Parts numbering system FIRST USED ON LOT BUPERSEDES SUPERSEDED Mach. No. PART NUMBER PART NAME MATERIAL 42976 Quill Retracting Cam Bearing Oilite A-1711-5 2706 - 298 2706 - 299 2706 42977 Serrated Locking Ring Stressproof. 2706 42978 Quill Adj. Worm Collar Nut SAE 1137 - 300 - 301 2706 42979 Quill Adjust Dial Collar Stressproof - 302 2706 42990 Quill Adjusting Dial 27185 - 303 2706 42981 Adj. Dial Spring Retainer SAE 4615 2706 42982 Cam Actuating Gear -304PARTS LIST - 309 2706 Quill Adi. Crank Ejector SAE 1020 42983 42984 Quill Guide Key Plug SAE 1020 - 313 2706 - 314 2706 Quill Guide Key 42985 Stressproof. - 315 2706 42986 Head Clamp Stud. CRS 2706 Head Gib - 316 42987 C.I. - 317 2706 42988 Head Gib Screw SAE 4140 - 318 2706 42989 Hd. Guide & Clamp Bar R.H. SAE 1020 - 319 2706 Hd. Guide & Clamp Bar L.H. 42990 SAE 1020 - 320 2706 Elevating Nut Dowel SAE 1020 42991 - 321 2706 Hand Elev. Bev. Gr. Fitt. Wash. SAE 1020 42992 42993 Head Elev. Scr. Gr. Fitt. Wash. SAE 1020 - 322 2706 30 - 323 2706 42994 Cap Screw Spd. Gr. Case Cover SAE 1020 1909 - 324 2706 42995 Head Elev. Scr. Oil Seal Coll - 325 42996 Head Elev. Screw Stressproof

Fig. 2. All parts, regardless of their application, are given numbers taken from the master parts list in the order requested.



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Fig. 3. (Left) A parts list is maintained for each assembly. Unit number is typed at top of page. Fig. 4. (Right) Data sheet of standard parts prevents duplication. Form shown is for a cutter.

not available, the manufactured and purchased components are requisitioned from the parts list of the unit. The various lists employed to complete each lot are bound and kept for reference when replacement parts are ordered.

Publication on External Threads Revised

A new edition of "Unified and American External Screw Threads," a booklet containing general information for both straight external and internal threads, based on the proposed revision of the American Standard B1.1 Draft of 1955, has been prepared by the Reed Rolled Thread Die Co. The tables in the publication are confined, however, to external threads, and the material has been arranged and compiled in condensed form for the convenience of those who use the thread-rolling process.

This 36-page, fully illustrated, edition is available from Reed Rolled Thread Die Co., Worcester 1, Mass., at a cost of 75 cents.

Survey Predicts Increased Use of "Throw-Away" Tools

A study by an independent technical research organization indicates that the use of single-point "throw-away" tools will be extended. An increase from the present total of 15 per cent of all single-point tools employed in the metalworking industry to an estimated figure of 40 per cent is predicted. This survey, sponsored by the Wesson Co., Detroit, Mich., also indicates that companies already employing throw-away tools will increase their average use to 60 per cent. Not a single company contacted reported an intent to use fewer throw-away insert tools than it was using at the time.

Indirect cost reductions, due to savings realized in maintenance of tool grinding facilities and in decreased machine down time for tool changes, appear to be the reasons for this trend. The survey also shows that industry is interested in adopting the "throw-away" principle to milling cutters, boring tools, and other more complex tools where sharpening is a major factor in production costs.

Cleaning Aircraft Galley Equipment

Aluminum and stainless-steel parts undergo a number of cleaning steps during fabrication into equipment for aircraft kitchens. Cleaning may be done merely to beautify items or as a prerequisite to welding.

In addition to increases in speed, safety, available flights, and airport facilities, airline passengers of today enjoy comforts and luxuries comparable to those found in a well-run hotel. Among these conveniences are the excellent full-course meals served en route by modern commercial airlines. Bomber crews, and even jet fighter pilots, are now enjoying hot meals at the flick of a switch.

Mansfield Aircraft Products Co., Mansfield, Ohio, is one of the organizations engaged in the production of items for the airborne kitchen such as electric ovens, thermostatically controlled liquid containers, and refrigerating equipment. The metals from which these units are constructed are chosen for their suitability for food service applications as well as their weight, strength, corrosion resistance, and ease of cleaning and sanitizing in use. Stainless steel and aluminum are used exclusively.

All aluminum components are cleaned at various stages of fabrication and also prior to inspection, assembly, or further treatment for spotwelding. Cleaning is accomplished by dipping

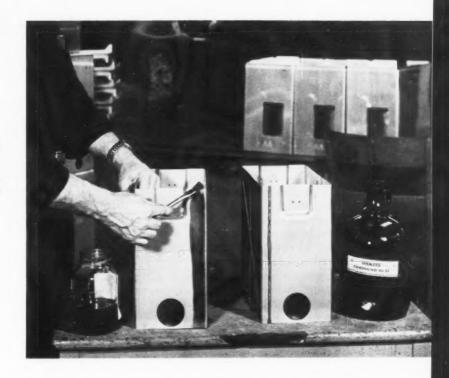
Fig. 1. Aluminum parts are dipped in a hot solution of an alkaline cleaner, prior to deoxidizing for spot-welding.



Fig. 2. After being cleaned, parts that are to be spot-welded are deoxidized to insure uniformly low electrical resistance.



Fig. 3. Removing heat discoloration from the Heliarc-welded seam of a beverage container. The left-hand unit shows the seam following welding, while the right-hand unit shows the seam after cleaning.



the parts in a tank containing a hot alkaline solution. For this operation, Fig. 1, Oakite composition No. 61-A is used.

Further processing is required on aluminum equipment that is to be spot-welded. When normally exposed to air, this metal builds up its own protective coating of aluminum oxide. The coating is invisible and is a non-conductor of electricity. Due to partially soiled areas, fingerprints, and variations in exposure, the natural oxide coating is of uneven thickness. All surfaces must be reduced to a uniformly low electrical resistance before the spot-welding machine can be adjusted to give consistently strong welds at a single control setting.

The parts are deoxidized by immersing them in a water solution of compound No. 34, Fig. 2, which is maintained at room temperature. Length of immersion is dependent on the alloy.

Stainless-steel equipment is Heliarc-welded, and preliminary treatment is not required. After welding, however, heat discoloration is removed from the areas surrounding the weld, and the parts are cleaned prior to further assembly. On some units, the stainless-steel surfaces must be conditioned to receive Scotchlite lettering designating the various airlines. These cleaning operations are accomplished with compound No. 33. It is used at room temperature and at varying concentrations with water. In Fig. 3 can be seen a small-scale demonstration of the removal of

heat discoloration after a seam has been welded. The partially completed hot- and cold-beverage container at the left shows a typical joint following welding, while the part at the right shows the joint after cleaning.

Report on the Benefits of Standardization Published

The findings of a special survey on the value of standardization have been made available in the form of a 40-page booklet entitled "Dollar Savings Through Standards." Conducted by the American Standards Association among its members, the investigation has covered some twenty-seven industries in this survey, including the machine tool field.

Seventy-nine documented cases are presented in this up-to-date version of the original 1951 edition. Many of these studies are completely new while others have substantial revisions and additions. Contents confirm earlier investigations and expand the significant findings of the survey. A number of the companies referred to in the report are identified by name. In general, the conclusions point out the importance of standardization to American industry.

A copy of the survey may be obtained on request from the American Standards Association. 70 E. 45th St., New York 17, N. Y.

Getting the Most from Your Cut-Off Dies

By FEDERICO STRASSER, Santiago, Chile

WITH a little ingenuity, a cut-off die can do double duty to shape the ends of a part blanked from strip stock. There is less scrap involved; die design, construction, and maintenance are simplified; and also, the same die can be used for similar parts of different length. The only important restrictions are that the particular shape be able to be incorporated in the design of the die, and that tolerances be sufficiently broad—around plus or minus 0.010 inch—since the cut-off die is not as accurate as a conventional blanking die.

Sometimes, a slight modification in a dimension of a part will prove practical. For example, if the ends of a part are to be rounded, it is customary to specify a radius corresponding to one-half the strip width, as in view A, Fig. 1. But this requires high accuracy in the construction of the die, since a slight misalignment of the strip and die will affect the appearance of the part ad-

versely, as in view B. A better design, shown in view C, is obtained with a radius that is greater than one-half the strip width. Or, as in view D, the radius can be held to one-half the strip width at the center and blended to a chamfer of about 15 degrees at the edges.

If a rounded end is not essential, the designer should consider the use of a chamfered straight end, view A, Fig. 2. In addition to its satisfactory appearance, this design has the advantage of lower die costs. Views B, C, and D show various end shapes obtained with cut-off dies that were fairly simple to construct.

From the standpoint of design and construction, there is no basic difference between a cutoff die and a blanking die. A few special details,
however, require consideration. If holes are to be
pierced in the same press operation, it is advisable to do the piercing a whole station in advance, as indicated in Fig. 3. In this way, there

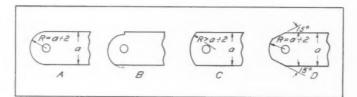


Fig. 1. These views show how good part appearance is assured by a slight modification of a radius.

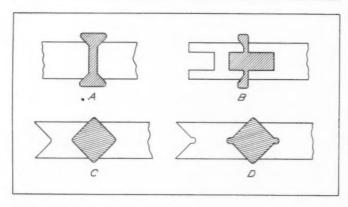


Fig. 2. The cut-off die can also be designed to produce a desired shape. Illustrated end shapes were obtained with cutoff dies of simple construction.

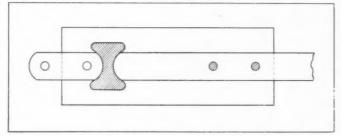
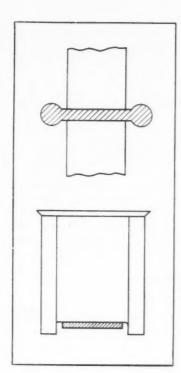


Fig. 3. Where possible, piercing should be done at α previous station, before the metal is severed from the strip, as shown in this drawing.



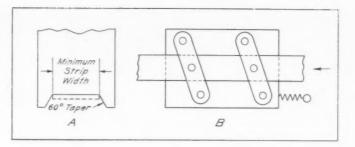
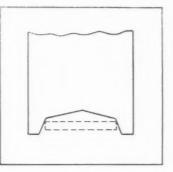


Fig. 4. (Left) The ribs seen at the front and back of the punch member serve to guide it into the die.

Fig. 5. (Above) The strip in view A is centered by the cutoff punch member; and in view B, by a parallelogram fixture.

Fig. 6. (Right) The punch works better on heavy or hard stock if it cuts progressively, as illustrated.



is an ample section of metal to give strength and avoid trouble. Also, the piercing punch should be longer than the cut-off die punch member, so that the strip can be accurately located and pierced before it is severed.

Cut-off dies should be designed to produce a minimum of scrap, yet be strong enough to resist all stresses. The best compromise is to make the narrowest section of the punch equal to twice the stock thickness, but in no case less than 3/16 inch. Since the punch does not cut with its entire periphery (particularly where the shape is not symmetrical), there is danger of its bending, and the cutting edges of both the punch and the die might be nicked.

It is good practice, where possible, to guide the punch into the die. One manner of doing this is illustrated in Fig. 4. A rib of metal, circular in section, is added along both the front and back of the punch. The ribs are longer than the actual cutting portion of the punch and are accommodated in mating circular areas in the die. Since the ribs enter the die before the rest of the punch contacts the strip, perfect alignment is assured, and the possibility of punch deflection is eliminated. The projecting part of the ribs is made only slightly more than the strip thickness, and the rib section can be square or some other shape, as well as circular.

Projections can also be utilized to compensate for strip width variations and for centralizing the strip. By tapering the inner sides of the projections 60 degrees and having the actual cutting portion correspond to the minimum width value of the stock, as in view A, Fig. 5, a satisfactory centralizing effect is obtained. Where it

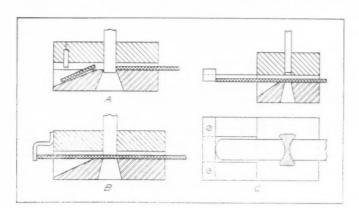


Fig. 7. View A shows a pin stop for a short stamping; view B, an S-piece stop for a stamping of moderate length; and view C, a bridged guide stop for a long stamping.

Fig. 8. This springloaded stop is recommended for thick strip stock.

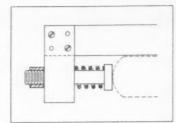
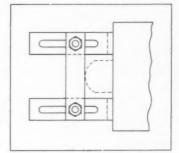


Fig. 9. The adjustable feature of this stop is ideal where part lots vary in length.



is necessary to compensate for the variation and to centralize the strip before a blanking operation, a simple device of the style illustrated in view B can be used. The strip is contained between two guides which are linked to form a parallelogram. The central pin of each link is fixed along an extension of the die center line.

If the stock is heavy or relatively hard, the punch can be designed to operate progressively, as in Fig. 6. The cutting begins at the outer sides of the strip and advances toward the center.

Several styles of stops are used with cut-off dies. For thin strip, the stop is stationary. If the part is short, the stop can consist of a pin in the bottom of the stripper, view A, Fig. 7. If the part is somewhat longer, an S piece can be screwed onto the exit side of the stripper, view B. In both instances, the top of the die-block has an adequate bevel to encourage the part to fall off.

With an increase in part length, it becomes difficult to work with a stop located in the stripper. Here, the simplest design consists of a pair of stock guides extending from the press, joined

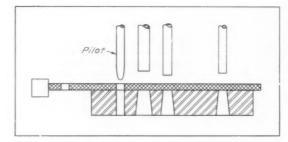


Fig. 10. The pilot immobilizes the work and thus increases the accuracy of the cut-off operation.

at their ends by a bridge which serves as a stop, as illustrated in view C.

A stop for a part made from thick strip should be spring-loaded, as in Fig. 8, to allow for creeping because of the plastic flow of the material. The spring has to be strong enough to locate the strip properly, yet still allow a small amount of movement. If part lots must vary in length, the stop requires an adjustable feature. One of the simplest such stops is illustrated in Fig. 9.

All of the stops described require relatively large tolerances. Where smaller tolerances are specified, extra pilot punches should be provided. As can be seen in Fig. 10, the pilot punch engages a previously completed hole and immobilizes the work during the cutting-off process. This punch must enter the hole before the other punches operate.

Work Simplification Program at AMF Saves \$213,000 Per Year

Working "smarter" instead of "harder" will save American Machine & Foundry Co., New York City, an estimated \$213,000 annually, as a result of the company's 1956 work simplification program. These savings reflect the efforts of only six of AMF's thirty-seven plants, and these six have had the program operating for an average of only five months. The program will be extended to other AMF plants during 1957.

The savings represent an average of nearly \$5000 per accepted proposal. With seventy-eight proposals under consideration, the total could reach \$500,000 in annual savings. Work simplification starts with an intensive training program for about ten to twelve people from several locations in a plant. These employes, who will later act as instructors, take a five-day training program that runs from 8:30 in the morning until late in the evening.

The aim of the program is to illustrate what work simplification consists of, to show how it can be put to practical application in the plant, and to gain the employes' acceptance of it so they will participate actively. The program also conditions the attitude of plant management, to help make the program a success.

When the training program is completed, the supervisors and foremen use the following approach to a specific operation:

- 1. Select a job to be improved:
- 2. Get the facts:
- 3. Study the facts to determine which details can be eliminated, combined, or improved;
- 4. Improve the method;
- 5. Put the new method into effect.

Pushing Back the Industrial Horizon of the Blind

Program for teaching sightless men to operate machine tools also serves as a proving ground for developing practical techniques aimed at bettering their service to industry

By HAROLD W. BREDIN



THE blind are farsighted when it comes to both themselves and society. At the Industrial Home for the Blind, Brooklyn, N. Y., a determined and well-planned effort is now being made to find ways and means of upgrading the role of the visually handicapped machinist in industry. This is a many-phased program that, in addition to research, includes training, rehabilitation, and placement of the worker.

Dedicated to the idea that any problem can be overcome, this leading organization for the blind and deaf-blind has sixty-four years' experience in preparing the blind for employment. The IHB runs its own workshops as a training ground and will not recommend machinists for industrial positions unless they are able to successfully compete with sighted employes. Men thus placed in industry must be capable of traveling to and from work independently.

Since inaugurating their program on behalf of the visually handicapped machinist some five years ago, machine tools have been purchased and equipped with special touch-type aids. Blind instructors, who have proved to be the most effective leaders of the blind, are constantly trying to devise new tools and techniques for use on these machines. In the heading illustration, a visually handicapped mechanic trainee is shown fingering the special dials of a bench milling machine at the IHB Vocational Institute.

Some of the special tools that have been de-

veloped for the blind machinist are illustrated in Fig. 1. For rough measurements, the Braille ruler in the foreground is used. This scale is graduated in sixteenths of an inch and has both raised and indented markings. Braille micrometers permit the visually handicapped mechanic to measure work-pieces to the thousandth of an inch. This is important, since on many jobs the tolerance to which a machinist can work is limited primarily by the accuracy of his measurements.

The Technical Research Council of the American Foundation for the Blind has made stepped gage-blocks that are available in sets. Three such gages are held on the right-hand side of the magnetic bar seen in Fig. 1. These blocks are designed so that each length, width, thickness, and step can be used for measurement. A range of sizes in 1/16-inch increments may be obtained by using these blocks in various combinations.

A simple and effective form of Braille dial for machine feeds is illustrated in Fig. 2. It is made from two gears of 100 teeth each which are mounted side by side on the feed-screw. The teeth of one gear are cut away so that every tenth tooth of the uncut gear is identified by a Braille marking. Also, every fifth tooth not so marked is allowed to remain. When used in combination with an appropriate touch-type pointer, the cutter can be accurately fed to the work purely by touch technique.

A bench lathe equipped with Braille dials and other aids is shown in Fig. 3. It is being operated



Fig. 1. Braille micrometers, special step gage-blocks, and a Braille ruler aid the visually handicapped machinist. A magnet block keeps small tools in a handy place.

by a blind mechanic. Setting the angle of the lathe compound is facilitated by the arc-shaped attachment. This device has holes at 5 degree intervals and rotates with the compound slide. A locating pin is used to line up the hole representing the required angle with a single hole in the upper cross-feed slide. When desired, the coarseness of these settings can be reduced by drilling additional positioning holes in the arc plate. The hook type gage in Fig. 1 is used to adjust the height of the tool bit. Cross-slide stops are also available. When tools are not in use,

they are placed on a magnetic block to keep them in a handy position.

The problem of making blueprints for the visually handicapped is also under investigation. One solution seems to be promising. A raised line drawing can be produced by drafting with a ball point pen on cellophane that has been placed on a rubber backing.

Milling work at the machine shop training facilities of the IHB is handled on the machine shown in the heading illustration. It is also equipped with Braille dials. When a dividing

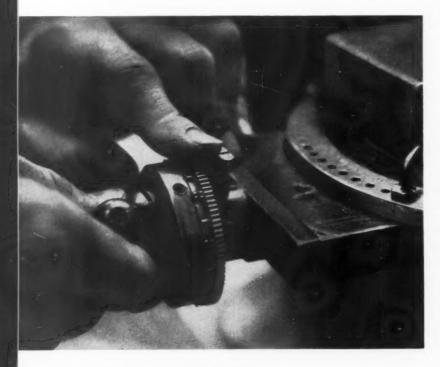


Fig. 2. Construction of Braille dial and raised indicator is shown close up. Dials are made of two gears, with the teeth of one cut away to leave raised markings.

Fig. 3. Braille dials allow blind mechanic to adjust lathe crossfeed slide accurately. The special angle indexing fixture is to facilitate his setting of the lathe compound slide.



head is used by a blind machinist, special dials are not required as the index-plates, having many holes, can be readily identified and manipulated by touch technique.

The subcontract department of the IHB is considering the production of precise spacers for electronic equipment. These will be cut from tubing in a lathe. Other projects planned include a tool for piano tuners that tapers down to about 0.050 inch, a tack hammer, and other tools. These are all to be machined by blind mechanics.

Further operations in the metalworking field are in the development stage. Several sheetmetal cutting and forming machines have been acquired, and preliminary research is under way.

Placement specialists are sent out to all branches of industry to contact employers, with the purpose of finding new job opportunities. Many of the aids and techniques developed at the IHB shops are used to train and instruct these specialists. Occasional technical problems that arise may often be solved after a consultation between the placement specialist and the employer.

Blind machinists have been and are being placed in competitive industry in a wide variety of jobs. Sub-assembly, deburring, or jig- and fixture-held work are usually chosen for these employes. Occasionally, men have been given quite complicated work. For example, one man successfully operated a milling machine for one of the largest industrial plants on Long Island. When sighted, he had been employed as a tool and die designer. Those who have had machine shop experience before losing their sight have a distinct advantage and will usually be able to compete at higher work levels. This is not always

the case, however, as the supervisor for the IHB Vocational Institute Training Center did not operate machine tools until after he became visually handicapped. The same applies to many other blind men placed in industry as machinists.

The most important factor in the IHB training program is safety. Safe approach to any machine or location is stressed. There must be no danger for the operator at his initial point of contact with the machine. Once this contact is mastered, the trained man can safely perform his task. For many years the IHB has received awards for safety. Its accident rate has been considerably below that of industry, and this experience has been reflected in reduced insurance rates. In addition, absenteeism and turnover are at a much lower rate among the blind workers.

Increased Use of Stainless Steel

Figures released by the American Iron and Steel Institute indicate record mill shipments of stainless-steel products in 1956 amounting to 687,699 net tons. The aircraft industry received 33,990 net tons of stainless steel, a 52 per cent jump over 1955 figures. This is a result of the increasing use of stainless steels in the construction of supersonic jet planes and guided missiles.

In the face of continued nickel shortages, more producers of stainless steel are beginning to expand their production of the low-nickel, high-manganese bearing stainless steels. These new steels—AISI types 201 and 202—are receiving increased attention by numerous fabricators as substitutes for the higher nickel grades.

Punched-Tape Control for Automatic Milling of Master Cams

No operator is required once a work-piece is set up and the start-button is pressed. Radii of master cams can be held to within 0.0005-inch limits.

By Mark Morgan, Project Engineer
Manufacturing Research Department
International Business Machines Corporation
Endicott, N. Y.

TODAY, many of the machines which are controlled by punched tape or cards are more complex than most machine tools. It should therefore be relatively simple to control a machine tool in a similar manner. Experiments along these lines have proved this to be the case. One such experiment has resulted in a tape-controlled milling machine that is used for machining master cams at the Endicott, N. Y., plant of the International Business Machines Corporation.

Many IBM machines are equipped with cams that have an irregular periphery. Such cams are produced on duplicating machines that require suitable master cams to guide the cutting tool. When producing these master cams on a jig borer, the operator manually positions the cutter in a series of settings that will yield the desired contour. At IBM, the special milling machine illustrated in Fig. 1 and a suitable punched tape are used to give the cam cutter a similar series of settings automatically. Since the tape punchings can position the tool in a large number of closely spaced settings, a smooth curve results, and no subsequent blending is required. Actually, the curve can be expressed as a mathematical equation that will give the length of radius corresponding to any desired angular position of cam.

The machine which has been designed for

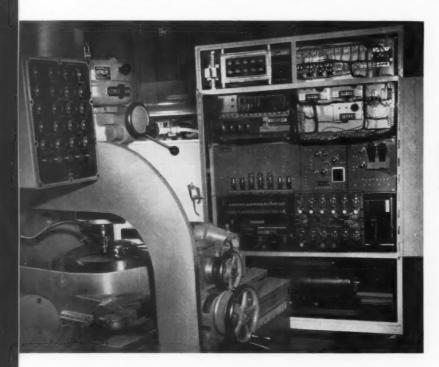
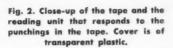
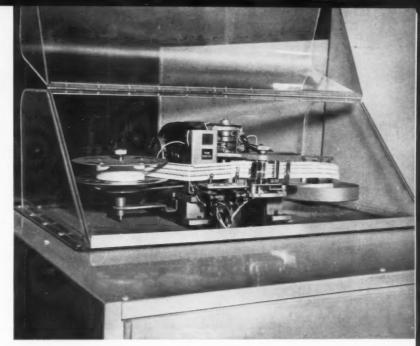


Fig. 1. On this special milling machine, the position of a cam in relation to the cutter is controlled by punched tape. Electrical and electronic equipment are in background.





this work is a vertical spindle milling machine equipped with a horizontal rotary table mounted on linear slides. The work-piece is positioned so that its axis is coincident with the axis of rotation of the rotary table.

A side-cutting end-mill, having a diameter equal to that of the cam follower, is revolved about the fixed vertical axis at the required cutting speed. In making a cam of prescribed profile, the work-piece is moved toward or away from the cutter and, simultaneously, is rotated slowly on the circular table. When an arc of constant radius is cut, the table rotates in a fixed linear position. In and out travel of the work-piece with respect to the tool is accomplished by automatically moving the rotary table along the linear slides in response to a machining program punched on the tape.

Except for control equipment, this milling machine was built by the Cincinnati Milling Machine Co. It was designed to IBM specifications, with the tape and other controls provided by IBM. A highly precise lead-screw, driven by a servo motor, is employed to give linear motion to the sliding table. Tool rotation can be varied through a wide range of cutting speeds. The circular table holding the work-piece is rotated at a constant rate, but the speed can be adjusted initially to suit the size of the cam. Steepness of the cam profile is also a factor governing the choice of an angular speed for the rotary table. Both tables are moved by mechanisms having virtually no backlash.

Changes in position of the sliding table occur in response to signals originating from the punched tape. The holes in the tape cause a reading unit to vary the voltage applied to the

Fig. 3. A master plate-cam is machined as the rotary table revolves at constant speed. This table and, consequently, the work are automatically moved along linear slides to give the cutter the required series of radial positions.



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Fig. 4. Machining of this face-cam is controlled by punched tape. The fixture holds the work concentric with the rotary table and moves so that the center of the cutter is always on a radius of the cam.

servo motor that drives the lead-screw. An adjustable speed motor is a part of the tape reading unit, and both the tape and the reader are enclosed in a separate transparent plastic cabinet, as shown in Fig. 2.

Indexing cams, driven by a motor, advance the tape through the reader mechanism step by step. Each step corresponds to a fixed angular increment of the work and the rotary table. Data determining the length of successive radii of the cam being cut are fed to the control system automatically as the work rotates on the table. Cam profiles are in accord with equations evolved to fit the specified performance and are transferred into polar coordinates for a series of equally spaced radii.

Tape employed is punched from IBM cards that are prepared on a digital computer. Impulses from the tape are transmitted to the milling machine by the electronic and electrical equipment illustrated at the right in Fig. 1. Design details and functioning of the system are beyond the scope of this article. It can be said, however, that it is possible to hold the radial distances on cams to within 0.0005 inch of the specified values. This accuracy is ample for the master cams required, and the results are consistent for different cams made from the same tape. A plate-cam that has the displacement curve cut on the periphery, Fig. 3, or a face-cam with the required curve cut into one face, as illustrated in Fig. 4, is machined with equal facility.

Focussing on Your Potential —Distributors' Theme

The thirty-third spring meeting of the American Machine Tool Distributors' Association was held at the El Mirador, Palm Springs, Calif., on March 6 and 7. There was a registered attendance of 345 members and guests—the second largest meeting, except for those in Cincinnati or in conjunction with Machine Tool Shows. "Focussing on Your Potential" was the program theme.

In his speech, "A Time for Decisive Optimism," Joseph F. Owens, president of the Association, was distinctly enthusiastic about business prospects. He stated that business during the first two months of this year tended to bear out the Association's year-end prediction that shipments of machine tools sold through distributors in 1957 would be from 5 to 15 per cent greater than the number shipped last year.

One of the features of the meeting was a panel discussion of the subject "Surveying the Market Potential." The panel members discussed extensively the advantages of using the Standard Industrial Classification System to four digits in analyzing market potentials in each distributor's district. Members of the panel were: N. R. Ladabouche, research director of Steel, Cleveland, Ohio; Robert D. Lawson, vice-president and sales manager, Norton Co., Worcester, Mass.; and I. B. Rabel, president, Star Machinery Co., Seattle, Wash.

Jerome A. Raterman, president of the National Machine Tool Builders' Association and president of the Monarch Machine Tool Co., Sidney, Ohio, spoke on the importance of close cooperation between machine tool builders and distributors.

MATERIALS

The properties and new applications of materials used in the mechanical industries

Platinum-Base Tungsten Carbide for Severe Corrosive Conditions

A material that withstands extremely severe corrosive conditions has been announced by Kennametal Inc., Latrobe, Pa. "K501," as this material is called, is a heat-resistant, low-cost, platinum-base cemented carbide. Applications for this material include: seal rings, metering orifices, bushings, nozzles, and many other component parts used in the chemical processing industry.

Production-Cut Teflon Tubing and Rod Available

Rigid and flexible tubing and rod made from Teflon, du Pont's trade name for Tetrafluoro-ethylene resin, have been made available by the Pennsylvania Fluorocarbon Co., Inc., 1115 N. 38th St., Philadelphia 4, Pa. The material may be obtained cut to lengths to meet specific needs in the aviation, electronic, electrical, and auto-motive industries. Production cutting techniques

result in tube and rod which is cut clean and square with no flattening.

Teflon has good electrical properties, chemical inertness to almost all solvents, and a low coefficient of friction. It may be used in a temperature range of from -455 degrees F. to +550 degrees F.

Expansible Compounds for Insulating and Reinforcing Voids

Two thermosetting, self-curing polyisocyanate foams for insulating and reinforcing voids between structural members have been made available by Adhesives and Coatings Division, Minnesota Mining & Manufacturing Co., 423 Piquette Ave., Detroit 2, Mich.

Designated Scotchfoam Brand Expansible Compound Type A and Type 1, these foams are especially adapted to filling cavities where light weight, structural strength, stiffening, vibration dampening, and durability are desired. Both compounds are two-part liquid formulations

Sample pieces of production-cut Teflon rod and tubing available for uses in the aviation, electrical, electronic, and automotive industries.



which, when mixed with a catalyst under proper conditions, can be foamed-in-place to produce a rigid, cellular material that will not break loose, settle, or sag. Application may be made by pouring or spraying.

Typical uses include insulating and reinforcing of voids in aircraft-tail assemblies and other structures and providing sound deadening and insulation between exterior and interior floor panels on railroad passenger cars.

Aluminum-Bronze Alloy for Casting and Hot-Working

Both high mechanical properties and good casting characteristics have been combined in an aluminum-bronze alloy—called Superston 40—which has been announced by Superston Corporation, 230 Park Ave., New York 17, N. Y. This two-phase (alpha-beta) alloy is nominally composed of 75 per cent copper, 12 per cent manganese, 8 per cent aluminum, 2 per cent nickel, and 3 per cent iron. It has a high yield strength, great toughness (Izod notched impact strength 18 to 30 ft.-lbs.), and a long fatigue life. The accompanying table gives properties for the three uses to which it has been put: sand castings, centrifugal castings, and wrought products.

Average Properties of Superston 40

Properties	Sand Castings	Centrifugal Castings	Wrought Products
Tensile strength, pounds per square inch	98,000	105,000	117,000
Yield strength (0.5 per cent elongation), pounds per square inch	48,000	50,000	67,000
Elongation, per cent in 2 inches	26	30	25
Reduction of area, per cent	28	30	27
Brinell Hardness (10-mm. ball 3000-kg. load)	185	190	205

The material is whitish gold in color, has a melting point of 1814 degrees F., casts easily, and can be readily forged, rolled, or extruded.

This material has been used for slippers in steel mills, condenser tube plates, nuts and bolts, rods, tubes, and welding rods.

Transparent Cutting Oil for High-Alloy Steel Tubing and Pipe

A transparent, heavy-duty, sulphurized cutting oil especially formulated for production threading of tubing, pipe, and couplings made from high-alloy steels has been announced by the Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa.

Advantages attributed to this oil, referred to as "Sunicut 85," are: transparency, low viscosity, ease of pumping, high heat absorption, quick metal-wetting, extreme pressure lubrication, and rust prevention.

Carbide for Cast Iron, Aluminum, Brass, and Plastics

A carbide especially developed for machining cast iron, aluminum, brass, and plastic has been announced by Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa. Called "Firthite NHA," it is being used in the aircraft industry for machining aluminum-alloy parts and also in the oil-well equipment industry for fabricating drilling rigs. This material can easily be brazed.

Resin Coating Protects Against Chemicals and Abrasion

A silicon-modified, synthetic-resin coating that protects all types of surfaces against acid or alkali cleaning solutions, steam, brine, and abrasion has been announced by the Mono-Seal, Division of Downer-Hunnewell, Inc., 6 Long Wharf, Boston 10, Mass. This coating, called "Mono-Seal," is smooth and continuous. It can easily be applied with any standard painting procedure or mechanical coating device. No costly preparation is needed—just a grease and dirt free surface. The coating air dries to touch in three hours or may be baked for five minutes at 275 degrees F. after air drying for five minutes.

Zinc Phosphatizing Compound for Use at Low Temperatures

A zinc phosphatizing compound for use at low temperatures in spray washing machines has been announced by Oakite Products, Inc., 126 Rector St., New York 6, N. Y. This material—Oakite CrysCoat LT—produces a fine-grained, dense, uniform coating which weighs between 150 and 300 milligrams per square foot. Application is made in five-stage washing machines at temperatures ranging from 120 to 140 degrees F.

Precision-Ground Gage and Die Steels with High Finish

Complete new lines of "VULground" flat-ground gage and die steels, both oil-hardening and air-hardening types, have been announced by Vulcan Crucible Steel Division, H. K. Porter Co., Inc., 300 Park Avenue, New York 22, N. Y. These steels are precision ground to a high finish and are available in standard 18- and 36-inch lengths in a wide range of thicknesses and widths. Special sizes are produced on order.

Smaller Prints Cut Reproduction Cost

By WILLIAM H. MEIER Supervisor of Reproductions Chance Vought Aircraft, Inc., Dallas, Tex.

REQUIREMENTS for the reproduction of drawings mount with the increasing perplexity of a company's products. This problem has been solved at Chance Vought Aircraft by reducing the size of the drawings photographically. In one year of operation, the consumption of blueprint paper has been cut 62 per cent, amounting to a saving of \$33,104. Additional savings result from reduced filing space requirements and easier handling.

Large-size original drawings are photocopied by means of a Neoflow reducing camera, Fig. 1, made by Peerless Photo Products, Inc., Shoreham, N. Y. Photocopying can be done either intermittently or on a continuous flow basis. Multiple work prints, which are sharp and clearly legible, can then be made from the reduced-scale copy by blueprinting or other photo-duplicating methods.

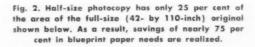
Previously, all engineering drawing releases were blueprinted actual size, and between forty-two and fifty copies were needed. By using half-size copies, Fig. 2, a 75 per cent reduction in paper area requirements is realized. For one air-plane alone, over 4000 engineering drawings have been made. About 48 per cent of these drawings vary in size from 34 by 44 inches to 34 by 144 inches prior to reduction.

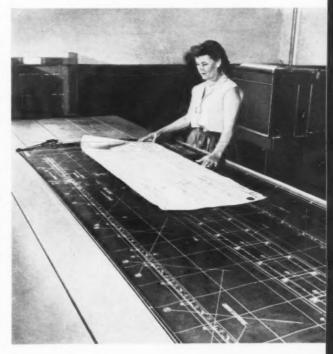
Other advantages include the ability to print twice as many drawings per hour and reduced needs for processing chemicals, water, operating personnel, and everything involved in the photocopy process. Also, folding, handling, collating, filing, mailing, and delivering are simplified.

Some engineering master drawings are made on material known as "Scrib Mylar Base," which is a plastic coated with white paint that permits scribing lines into the painted surface. This material is reduced to half size by the Neoflow camera, and necessary reproductions are made from the half-size negative. Any type of original vellum, tracing cloth, transparency, Vandyke, Ozalid, blueprint, or similar material can be processed to obtain a reduced-size transparent copy. The copy is suitable for additional reproduction by the direct print or blueprint processes at speeds up to five times faster.



Fig. 1. Large-size engineering drawing being fed into a reducing camera. The half-size photocopy obtained is used for further reproduction by conventional processes, such as blueprinting or direct-print method.





Ideas for Shop and Drafting-Room

Lathe Device for Boring Large Tapered Holes

By H. J. GERBER, Stillwater, Okla.

In one particular case, a quantity of large bronze bushings were to be taper-bored on an engine lathe. It was found, however, that the taper angle was too great to permit use of the taper attachment and, also, that hand feeding the compound rest was too laborious in view of the number of pieces involved.

In the illustration is shown the setup employed to surmount these obstacles. At X may be seen an offset bracket assembly that serves the same purpose as would an offset tailstock if the taper angle were smaller. A stub center A is pressed into a hole drilled and reamed through bracket B. This center must be carefully located. It is important that distance Z, between the center line of A and the lathe axis, is such that the proper taper will be produced.

Support rod C passes through the bracket vertically with its lower end resting on the lathe bed to support the offset bracket assembly in a horizontal position. A clamping arrangement is provided by splitting the bracket end opposite the stub center and adding lock-screw D. This

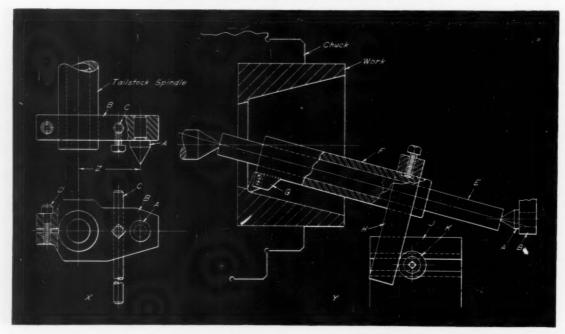
permits the offset center assembly to be secured to the tailstock spindle.

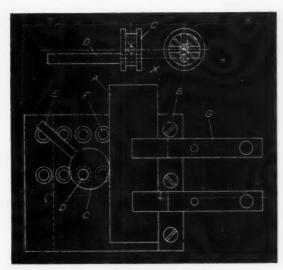
Between the stub center and the conventional headstock center is placed a hardened and ground shaft E, shown at Y in the illustration. A long sleeve F is a sliding fit on this shaft. Block G is welded to the forward end of the sleeve and is slotted to receive a tool bit. On the rear end of the sleeve is clamped an arm H, the extended end of which is supported by the compound rest I and backed up by the toolpost K.

During the taper-boring operation, with the carriage advancing under power feed, toolpost K will be forced against arm H. This will cause sleeve F to advance along shaft E, thus continually feeding the tool bit into the work at the desired angle. The compound rest absorbs the downward thrust from arm H.

To simplify this setup, separate tool bits were ground to different lengths and used in sequence for roughing and finishing cuts. This can be eliminated, however, by incorporating an adjustment feature into the tool-block.

Tailstock bracket provides necessary offset for taper-boring large bushings by means of a shaft and movable sleeve arrangement.





A cam type locking device that can be applied in various positions on an angle-plate.

Cam Type Locking Device that Accommodates Wide Range of Work

By J. RANDOLPH LUCAS, Richmond, Va.

A cam type locking device for use in combination with an angle-plate to accommodate work-pieces of various widths is here illustrated. The clamping device can readily be inserted in different holes of the angle-plate to increase or decrease the horizontal distance between the cam and a vertical locating surface on one side of the angle-plate.

Referring to the illustration, work-piece A is clamped against one side of bar B. The locking device, shown at X, is constructed of a cylindrical member C that is a press-fit on shaft D. This shaft is offset from the center of cylinder C. A handle E is inserted into any one of three holes located on the periphery of member C. The locking device can be positioned in any one of the countersunk holes F on the angle-plate. Shaft D is a close sliding fit in these holes, which are suitably spaced to accommodate a wide range of work sizes. A hole is selected that is close enough to the work to permit the locking action to be utilized. Member C is rotated eccentrically by means of handle E to exert pressure against the work-piece. Parallel clamps G are used to hold the work-piece against the face of the angle-plate.

This layout fixture permits the work-piece to be held at a compound angle to reference surfaces.

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Universal Layout Fixture for Compound-Angle Work

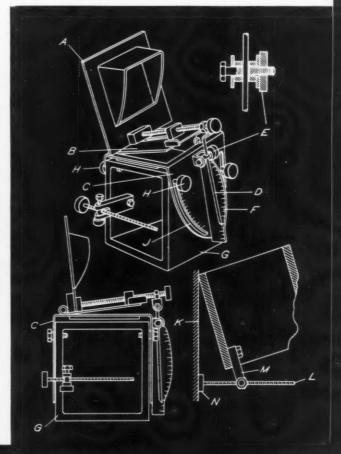
By JOHN A. VERNON, Philadelphia, Pa.

Small jobs that must be laid out at compound angles to reference surfaces can be supported in the universal fixture illustrated. The device can also be used as an inspection fixture or as a work fixture for light drilling.

The work-piece A is gripped in a vise B, the base of which is hinged to a saddle C. Upward tilt of the vise is maintained by a rod D. This rod has a swivel joint with the vise base and runs through a knurled thumb-screw assembly E fixed to the saddle. Front-to-rear inclination of the vise, up to 45 degrees, is indicated by the position of the point of the rod along a fin F.

The saddle, in turn, has a left or right side tilt of 55 degrees over the block G. Lateral inclination of the saddle is maintained by four thumb-screws H engaging degree-graduated slots J in the saddle. These thumb-screws also serve as bearings for the saddle.

The block itself can be accurately offset from a vertical reference surface K by measuring with a sine rod L. This rod has a swivel joint with a yoke M fastened to the inner wall of the block. A pad N bears against the reference surface.



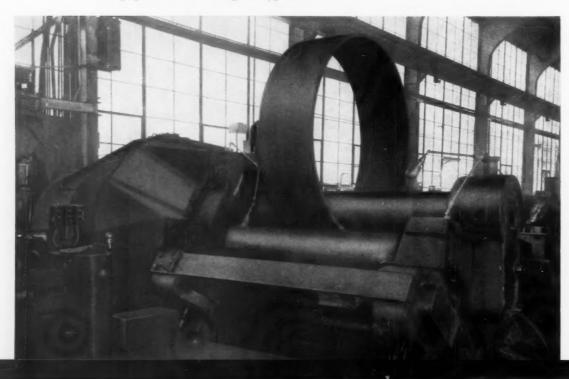




Camera highlights of some interesting operations performed in various metalworking plants throughout the nation

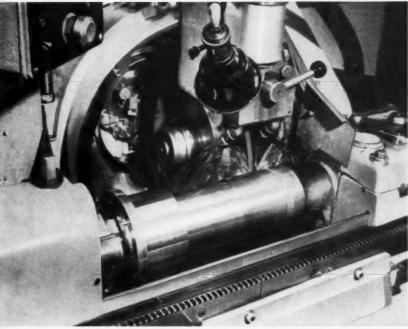
CUTAWAY VIEW—Formidable-looking riser weighing 60 tons is shown after being cut off a steel casting for a drop-hammer anvil at Erie Forge & Steel Corporation's Buffalo, N. Y., plant. Working alone, operator completed the job in only four hours. Nozzle of new Oxweld blowpipe used is off center. To widen kerf, blowpipe is simply rotated.

SMOOTH RIDING AHEAD—Forming one of the three tires of a road roller at Austin-Western Co., Aurora, Ill. Tire has an outside diameter of 69 inches and a width of 24 inches. Tolerance on the diameter is held within 1/16 inch, eliminating the need for subsequent machining. Equipment is a Bertsch pinch type roll.



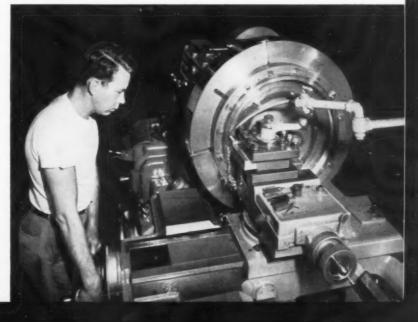
KING-SIZE TABLE TOP—World's largest surface plate of Pennsylvania black diabase granite is installed in quality control department of Avco Mfg. Corporation's Research and Advanced Development Division at Lawrence, Mass. Foot-thick slab weighs 8 tons, makes possible alignment inspection to an accuracy of 0.002 inch in 6 feet.





TENNESSEE TUNNEL—Grinding the head of a huge socket-head screw at Cleveland Cap Screw Co., Cleveland, Ohio. Fifty of the screws, 4 1/2 inches in diameter, will be used in the supersonic nozzle assembly of the nation's largest propulsion wind tunnel, at Tullahoma, Tenn. After machining, screws are silver plated.

RINGS FOR JETS— Machining a spacer ring for a jet-engine compressor section at Merz Engineering Co., Indianapolis, Ind. Alloy-steel ring is held in a pot type fixture while the internal contour is formed. High-speed steel tools produce a 32 microinch finish. The lathe employed is a 32-inch Monarch.



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Talking With Sales Managers

By BERNARD LESTER
Management Consulting Engineer

Who Will Take His Place?

FOLLOWING the inauguration of a young man as president of a small college, he asked his chum—an English instructor—to come to his office. They discussed the past and future—particularly the doting ex-president who had sadly overshot his time.

"Here is a vow I'll ask you to make," said the new president. "If you ever see me slipping, promise to march in here and tell me?"

The English instructor agreed.

Thirty years later, following a famous career, the president began to slip badly. His chum, now the gray-thatched English Department head, watched events anxiously. Finally he ventured into the president's office. As he hesitatingly recalled the thirty-year-old vow, the president interrupted.

"Yes, I remember that exactly . . . just the day after my inaugural . . . and I want to repeat, if you ever do see me slipping, you really must come in . . . splendid of you to call . . . I was just about to send for you. Now let's go over next year's plans for the English Department."

In like fashion, a lot of us get completely wrapped up in current business adventures. We not only neglect to prepare for vacancies, but unwittingly refuse to admit that they will occur. We incline to brush aside thoughts such as these when applied to ourselves. Most of all, we shrink from considering sudden loss by incapacity or the attraction of "greener pastures." That is one reason why the question "who will take his place?" is so often asked with dismay and frustration.

Preparing to fill organizational vacancies should be a pressing phase of sales planning in relation to personnel. Beyond this, it is an administrative duty which should have a fixed place on the sales manager's calendar. Industry as a whole recognizes policies such as these to be sound:

Advance men from within. Seek men from without only where entirely new talents and skills are needed.

Maintain a reservoir of young men in

training, irrespective of short-term business fluctuations.

Shape the personnel training plan to develop specialists and "generalists." Both are equally important.

Define each job. Likewise, progressively define the aptitudes, skills, and aspirations of each man, which often change when exposed to a variety of work.

One sales manager writes: "Should you have a second man for every job, perhaps marking time? I am enough of an opportunist not to get worn out worrying over the unexpected. So far I've gotten along pretty well by picking a likely pair of feet to fit a pair of shoes when they become vacated."

Another experienced sales manager read the quoted statement and exclaimed: "It is disastrous to have men—assuming you could keep them—waiting to fill every job. But don't forget, building and maintaining a sales organization is a job in human engineering.

One vacancy filled from within causes others. Besides being factual, you must imagine what may occur. Sure, you can't always foretell. You consider fate as well as time. You simply must prepare. And, best of all, as you review precautionary plans, you move ahead right along the track of knowing and developing men."

For the smaller equipment builder or supplier there are three steps to take, besides providing over-all facilities for selection and training.

- 1. Establish quantitative and qualitative needs.
- Analyze possible replacement of each key man as an individual.
- Encourage each key man to help develop a successor.

One way to help answer "Who will take his place?" is to ask each key man: "Who will take your place? You want to advance, don't you?--Well, one way to help do it is to help develop a successor. Men have been held down—hoodwinked by thinking they must only make themselves indispensable where they are."

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April 1957

WHAT THE DESIGNER SHOULD KNOW ABOUT COLD-HEADING

By THEODORE B. SMITH, President John Hassall, Inc. Westbury, N. Y.

MACHINERY'S elerence Section

What the Designer Should Know About Cold-Heading

By THEODORE B. SMITH, President John Hassall, Inc. Westbury, N. Y.



In any design project, the feasibility of producing parts by cold-heading should be explored early—before the design is fixed. Factors that help the designer take full advantage of the potentialities of this process are here discussed.

A LTHOUGH the cold-heading process has long been an accepted method of manufacturing standard nuts, bolts, nails, screws, and rivets, it is overlooked by many designers as a low-cost means of mass-producing both small machine parts and special fasteners. The reason for this is often a lack of familiarity with the cold-heading process and what it can accomplish.

In manufacturing all but the simplest of shapes, several cold-heading steps are involved, and secondary operations are frequently required. These vary considerably from part to part, and specialized skills, experience, and equipment are prerequisites in determining the proper method of production.

This knowledge is largely empirical—acquired after years of experience—and involves a knack for recognizing how a part can best be made from both the technical and economical viewpoints. It is often difficult, therefore, for the designer to distinguish just what parts can be coldheaded economically.

Manufacturers welcome inquiries as to the

possibilities of cold-heading parts. They also urge that complete performance requirements be given with the inquiry, so that intelligent design modifications may be suggested. Often a better and/or less expensive part will result.

It is impractical and unnecessary for an engineer who devotes only a small portion of his time to the design of components which may be cold-headed to learn the intricacies of the process. He should, however, be familiar with it to the extent that he will recognize when a part can be cold-headed.

Engineers often specify production by a method which is more expensive and not as satisfactory in performance. This is indicated by the not too infrequent change-overs to coldheading after a part has been fabricated by other methods. In such cases, the original designer usually is not aware of the possibilities of coldheading, and the opportunity of effecting cost savings is discovered after the part is in production. One manufacturer, having cold-heading as well as other production facilities, has found that parts which could be produced better by cold-

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heading are often specified by designers to be made by other methods at a higher cost.

Metal is Formed Cold in Dies by Automatic Machines

Cold-heading is a high-speed automatic process by which sections of wire or rod stock are sheared to length and formed cold by flowing between dies. Stated another way: cold-heading is a process wherein the metal is deformed beyond its elastic limit to take a permanent set in the particular shape desired. Cold-heading also is referred to as cold-forming, cold-upsetting, and cold-forging.

Most cold-headed parts are made from colddrawn wire stock. Supported on a reel, this stock passes through straighteners and feed-rolls into the cold-heading machine where it comes to rest against a stop. Depending upon the part and the machine used, the wire may be sheared to size before forming (as in a rivet machine), or it may be first headed and then sheared (as in a nail machine).

There are two types of cold-heading machines—the solid die and open die types. A basic understanding of each is important.

In the case of the solid-die machine, the body of the die is a steel cylinder with an axial hole passing through it as illustrated in Fig. 1. The wire is fed through straightening rolls until it comes against the positive stop which is adjusted to the required length of the blank. Cut-off knives shear the wire against a quill and also carry the blank to a position directly over the hole in the die. The heading-punch now starts pushing this blank forward into the die until it is stopped by a knock-out pin. After the blank meets the knock-out pin, the forward motion of the heading-punch continues and forms the head to the desired shape in the punch, in the body die, or in a combination of both.

At the moment the stock begins to upset, the thrust is taken, largely by the newly formed shoulders pushing against the face of the die, and the pressure on the knock-out pin is correspondingly reduced. After the punch retracts, the knock-out pin moves forward to eject the headed blank. This completes the forming cycle in a single-blow machine.

The body dies of an open-die machine are made of two identical square-ended steel blocks (Fig. 2). Semicircular grooves along the length of a side of one block match a similar groove in the second block. The body die is formed when these grooves are faced together. Four combinations of the same lengths, but different diameters

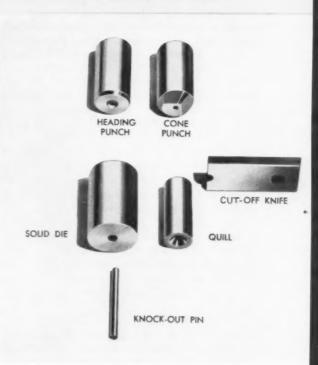
and shapes, are possible from each set of open dies. In operation, wire feeds into the parted cylindrical opening between the die faces, is gripped between the die blocks, sheared, and formed. The blocks then open sufficiently wide for the part to fall through or just enough for the piece to be pushed out by the incoming wire.

Cold-Heading is a High-Speed Process

The upset, or head, can be formed in the cavity of the punch, in the cavity of the body die, in the cavities of both, or between the dies. These methods are shown in Fig. 3. The operation takes place at a great speed, and rates of up to 400 parts per minute are attained.

As a rule of thumb, cold-headed parts are made in one blow whenever the length of the portion of the blank to be upset is less than two and one-half times the wire diameter. When an effort is made to upset a greater amount, the wire does not upset uniformly, and two or more blows are required. Most parts are made in two

Fig. 1. Components of a solid die used in a cold-heading machine. Work is fed, cut-off, formed, and ejected automatically. Forming takes place in punch and/or die.



MACHINERY'S elerence Section

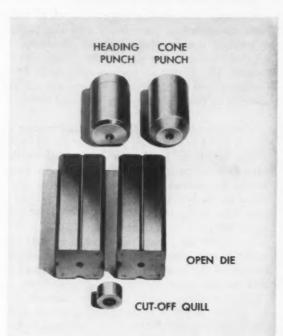


Fig. 2. In an open die, wire is gripped in the grooves by closing gap between the die-blocks. Four different parts of the same length can be made with this die.

produce since fewer dies and less machine time are required.

Solid-die machines generally are best suited for short parts and are easier to make than the open-die type. Solid dies can also be designed to extrude simultaneously with the heading operation whereas open dies cannot.

When the length of the shank exceeds ten to twelve times the diameter, ejection of the part from solid dies becomes difficult and impractical. Therefore, long parts are usually made in opendie headers. Open dies are also generally used where wire blanks are less than 1/16 inch in diameter, since the knock-out pin would be too thin to hold the blank during heading or to eject the finished part. In addition, open dies must be used in double-end headers. These are headers in which both ends of the blank are upset simultaneously. Reheaders—machines which form a

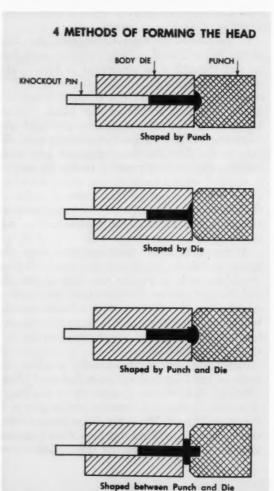
blows: the first gathers the metal into a conical upset, the shape of which is most important; the second blow continues this graduated flow of metal into the final head form. Cold shuts or faults in the upset are thereby avoided. Stages in multiple-blow production of two parts by cold-heading are illustrated in Fig. 4. The superior strength characteristic of cold-heading is due to this even, unbroken grain flow (Fig. 5).

When the length of wire required to form the head is from four and one-half to seven times the diameter, three blows are required; for seven times the diameter or longer, four blows are needed.

In applying multiple blows, the blank may be held in the original body die for all blows or may be automatically transferred to other dies for the subsequent blows. The latter process is referred to as progressive heading. Fig. 4 shows a rivet made in two blows and also illustrates a part made in a progressive header. This part is used as the stopper in a shaving lotion container.

Dies are designed by the manufacturer of coldheaded parts. The number of blows depends upon the volume to be upset, the metal that is used, and the shape of the head. When fewer blows are used, the part is more economical to

Fig. 3. Upsets are formed with the punch and die by one of these four methods. The knock-out pin backs up the work during heading.





second upset on the opposite end of an already upset part—require the use of open dies in order to eject the completed part.

Cold-Heading Used with Other Processes

In addition to upsetting, cold-heading manufacturers generally perform other closely related operations. For example, since it is difficult to upset square, or specially shaped heads, many fasteners and parts are first cold-headed and then trimmed to shape. This is done either by a trimming punch in the same machine, as in a progressive header, or in a separate machine called a bolt head trimmer.

As previously mentioned, extrusion as well as upsetting is accomplished with cold-heading equipment. An extrusion is the first step in producing the bottle stopper part in Fig. 4. Also, the square end on the second part from the left in Fig. 11 is formed by forcing the wire into a die having a smaller diameter. Generally speaking, an angle at the point of extrusion is necessary, with close to 15 degrees being accepted as giving the best results.

Thread-rolling is another operation performed by cold-heading manufacturers. Headed blanks are rotated under pressure between hardened steel dies whose working surfaces are the reverse of the thread-form to be produced. The threads

Fig. 5. Grain structure of cold-headed part follows contour of upset and results in increased structural strength. Note scrap produced when this part is machined from the solid.

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Fig. 4. Two upper pieces show steps in making a rivet in a two-blow header. The lower group illustrates stages in forming a stopper part on a progressive header.

of the dies upset the surface of the blank by displacing material to form the roots of the rolled threads. Displaced material is forced radially outward to form the crests. Metal fibers that are usually parallel to the axis of the blank are thereby crimped to the required contour. The finished part drops off at the end of the stroke. Thread-rolling is done automatically, at speeds ranging from 3000 to 30,000 pieces per hour.

Rolled threads have several advantages over cut threads. Closer dimensional fit can be obtained and the threads themselves are about 13 per cent stronger. This is due to the cold-working of the metal and the fact that the flow lines in the steel are continuous.

The maximum stock size for parts that can be made by cold-heading seldom exceeds 3/4 inch in diameter. From a technical viewpoint, there is no limitation on the length of a work-piece, since special open-die headers, known as spoke or rod headers, can accommodate blanks of any length. In practice, heading machines can handle parts with diameters from about 1/32 inch up to a maximum of about 3/4 inch, and lengths from a minimum of around 1/16 inch to 10 inches.

To form large upsets, multiple blows are necessary, and these are supplemented by intermediate annealing. Rarely can the volume of the upset exceed that contained in a ten diameter length of the wire.

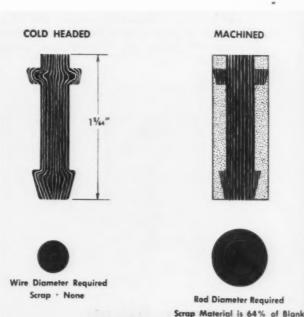
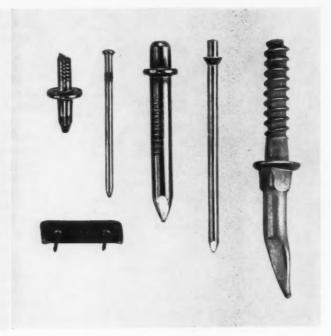


Fig. 6. (Right) These parts are all made on nail machines. Several are completed with secondary operations such as thread-rolling and knurling.

Fig. 7. (Below) Parts shown here are made on a riveting machine. First two rivets are tubular and the hinge pin is fluted beneath the head.



The possibilities of cold-heading are extensive when the process is used in conjunction with secondary operations such as slotting, drilling, tapping, threading, swaging, milling, fluting, grinding, knurling, and trimming. Even with secondary operations, cold-heading is often less expensive. In addition, improved part characteristics and performance may be obtained.

High Production, Smooth Finish, and Good Physical Characteristics Are Obtained

Cold-heading is generally feasible only when the volume of production is high. The minimum is about 5000 pieces, but, in most cases, several times this amount must be produced before the process becomes competitive.

Under volume requirements, cold-heading offers several advantages. The first is economy. One factor is the high rate of production. Since the operation is entirely automatic, the only manual labor required is for machine setup and parts handling.

Also, the process produces virtually no scrap (as in machining) and no scale is formed (as in hot forging). Another factor is that the cost of raw material is generally less than that required for other methods.

In addition, there are physical advantages to the process. As the flow lines of the material follow the section contour (Fig. 5), the fatigue and shock resistance of the finished part are increased. Also, the tensile strength of materials such as low-carbon steel and non-ferrous metals is increased by the cold-working. The smooth, toughened surfaces produced by drawing raw metal into wire are retained, and good surface finishes result from the cold-forming of the parts.

Other advantages include close dimensional tolerances, smooth rounded corners and fillets, and a definite lack of burrs. The quality of cold-headed parts is maintained by carefully selecting only the wire types that are both ductile and highly resistant to cracking.

Die costs usually compare favorably with those for other forming operations (such as stamping, or drawing), and also with those for many cast-

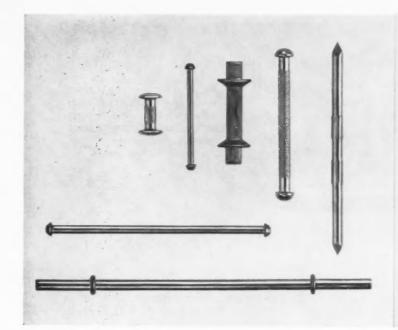


Fig. 8. (Left) Both ends of parts made on double-end header are formed simultaneously. Spacers for machine parts and toy axles are among components made in this manner.

Fig. 9. (Below) These parts are made by re-heading. After first upset is made, the second head is formed in another machine especially adapted to handle this type of work-piece.

ing or molding processes (such as die-casting or plastic molding). In addition, cold-headed parts usually can be produced with eccentric portions, wings, flats, or ovals. By comparison, turned parts must usually be symmetrical and concentric.

Many Metals can be Cold-Headed

The number of metals which can be coldheaded is large, and the designer should have no difficulty in obtaining cold-headed parts of the same metal as the major components of a product.

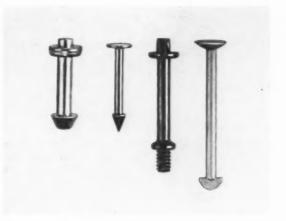
In general, ductile metals are best suited for cold-heading since they flow easier and result in a minimum of die wear. However, if less ductile metals are required, they usually can be cold-headed, but at a higher die cost.

Besides the carbon steels, both chrome and nickel-chrome stainless steels are cold-headed in great quantity. Most non-ferrous metals—copper, brass, nickel, silver, and Monel among others—can be successfully upset. Aluminum and aluminum alloys cold-head easily and are being employed in greater volume as more uses are being found. Silver, platinum, and gold are often specified for instrument and jewelry parts. Rivets have been cold-headed from commercially pure titanium wire. Final designation of the composition of the metal to be used can often be determined after consulting with a manufacturer of cold-headed parts and considering the end use of the particular component desired.

Cold-headed parts can be held to almost any commercial tolerance. As with other metalworking processes, tolerances should not be specified closer than needed. Dies for close tolerance workpieces must be discarded sooner than would be necessary when wider tolerances are employed, and consequently the cost per part is higher. In cases where long runs of close-tolerance parts are required, tungsten-carbide dies are often used.

Multiplicity of Small and Odd-Shaped Parts are Cold-Headed

Thousands of parts are made by the cold-heading process—parts with which we come into contact many times daily—parts of end products such



MACHINERY'S elerence Section

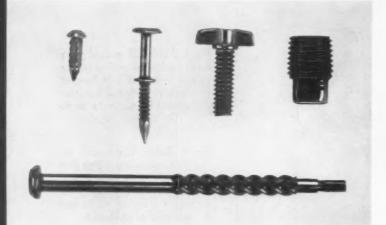


Fig. 10. Thread-rolling is often combined with other cold-heading operations to produce parts such as these. Horizontal piece formerly was machined and made in two pieces.

as eye glasses, fountain pens, electric shavers, automobiles, instruments, and deep freeze units. These parts are generally classified as fasteners and small machine parts. However, such terms do not describe the multitude of pieces which can be made by cold-heading.

Since the nail is one of the best known products made by cold-heading, a discussion of the manufacturing method is pertinent. Nails are formed from wire fed to the machine between straightening rolls into gripping dies of the open type. When the proper wire length has been advanced, the dies close, and the nail head is formed with one blow of a heading hammer. The hammer withdraws, the dies open, and the headed wire advances the length of the nail. It is again gripped in the dies, and point cutters clip the wire off, making the point at the same time. Enough wire is allowed to project beyond the face of the gripping dies to make the head of the next nail. As the punch advances for the next heading stroke, the finished piece is knocked

Typical examples of products made or partially made in nail machines are shown in Fig. 6. The first part at the left is a peg which fits into the spinning end of a toy top. This peg has a collar rather than a head, and grooves are formed on the portion that fits into the wood. The rounded point is shaped at the same time as the collar, and the grooves are formed by the gripping die.

The second work-piece from the left is the shank of a dentist's brush, the brush being affixed to the headed end. This part is tumbled with abrasives to round the point and then knurled to provide a secure grip. Knurling, and also fluting, are accomplished in a manner similar to thread-rolling. Mandrels used with small power

tools for holding grinding wheels, buffers, and the like are made in this manner.

The third part from the left is another collar nail. This one is used as a pintle in the ends of a bobbin. The fourth piece, also a collar nail, is assembled with a large washer, the head being flattened to hold the washer in place. The completed part is used for installing thermal type insulation.

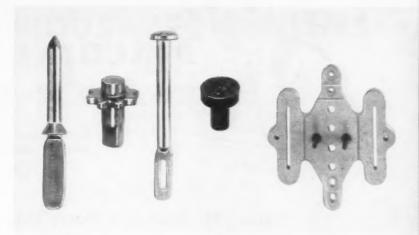
The next product is the point which fits into the end of a ski-pole. This part is made on a nail machine, the square upset, as well as the circular collar and point, being formed in one operation. A secondary operation is used to bend the point, and finally the ski-pole end is threaded with a wood-screw thread. The completed part is cadmium-plated.

The horizontal work-piece is a brass insert for buttons and ribbons worn by members of the armed services. Collar nails are brazed or silver-soldered to the base piece to which the button or ribbon is fixed. A groove is rolled into each prong to fit the clutch-fastener. The fastener holds the button or ribbon to the uniform after the pointed prongs are pushed through the cloth. The cold-headed prongs cost less than one-fifth that of these parts made in the original design.

Typical products prepared on rivet machines are illustrated in Fig. 7. In the upper row, the collar rivet at the left and the shoulder rivet in the center are tubular in section, while the short shank, large head rivet at the upper right is solid. The remaining part is a hinge pin that has a portion of the shank, adjacent to the head, fluted.

Double-end header machines produce parts as shown in Fig. 8. The part to the extreme left is a locking element used in a trouser-creasing device. Fluted part shown locks the adjustable de-

Fig. 11. Miscellaneous parts made by cold-heading and secondary operations. Close tolerances are held for parts intricate sub-assemblies such as ceramic base at right.



vice in any given position. The next piece and the two horizontal pieces are axles for toys. Center part is a spacer used to secure machine components a fixed distance apart. Brass-knurled piece, second from right, is the holding mechanism of an army belt buckle. The last part, also for a toy, has pointed ends which fit into wheels, while a second part that rotates with the axle fits into the fluted areas.

When parts are made by re-heading, one head is formed on a conventional header and then a second head is upset on another machine. Reheading machines are hopper fed, the parts being lined up mechanically for proper positioning in the dies. Some parts made in this manner are seen in Fig. 9. Beginning at the left in the illustration, the first part is one that is riveted to a metal base, and the headed shank is then fitted into a rubber grommet. Substitution of this part for the one previously used resulted in a cost savings of 63 per cent. The next piece holds acoustical tile to walls or ceiling. The flat end fits into a metal strip built into the tile, and the shank fits into a mating part that is secured to the surface to be tiled. Both this and the first part have one end made in one blow, and the other, in two.

The third piece in Fig. 9 has two unequal upset collars. One end is threaded and the other, square. Part at the right has a wing-shaped upset at one end—a shape not readily produced by other methods.

Several threaded pieces which combine previously described cold-heading operations with threading are illustrated in Fig. 10. The horizontal part is particularly interesting since it was formerly made in two parts. It is the piece which, when pushed, swirls the contents of ash trays into the receptacle below. The headed but unthreaded

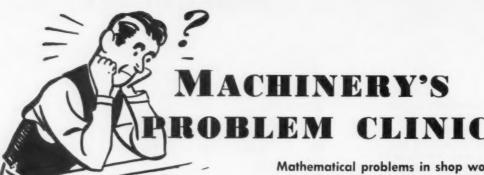
section originally was a separate part. It had an axial hole which was made a force fit on the turned end of the threaded section. The two cylindrical sections below the threaded portion were also machined, and the end section, fluted. Now the part is headed, roll-threaded, turned and fluted at a saving.

When the shank of a finished part is not round, savings often can be made by using other than round wire. Rivets with flat sides, half-round rivets, and flat nails (so made to prevent turning) are fabricated from special cross-section wire. Production costs are reduced since at least one forming operation is eliminated.

Other examples of cold-headed parts are illustrated in Fig. 11. The part to the left is formed as a collar nail and then flattened. It is used as a welding stud for fastening insulation to the bulkhead of a ship. The next piece is a gear for tilting venetian blinds. The square end is extruded, and a circular collar is formed in one operation. The gear teeth are formed as a secondary trimming operation.

The third part is an aluminum pin used in sealing meters. It is formed on a rivet machine, and the end is flattened and pierced. The part second from the right is used as a hammer in a riveting machine. Surface impressions which guide the rivet sections as they split and curl are formed by a heading operation. Electrodes such as those bonded into the ceramic piece at the extreme right frequently are made to close tolerances.

The foregoing illustrates some of the many opportunities that exist for using color-heading in the manufacture of small parts. It requires visualization of tooling methods and attention to design details in adapting parts to this process, but it may prove least expensive in production.



Mathematical problems in shop work and tool design submitted by readers of MACHINERY

Edited by HENRY H. RYFFEL

Raising Decimals to a Power Using Logarithms

One of our readers writes us that he has been working with logarithms for years but that every time he has to raise a decimal fraction to other than a whole number power he runs into trouble. He does not know whether his answers are correct since he is not sure of the method he employs. The problem submitted as a typical case in point was that of raising 0.04 to the 1.29 power using logarithms.

Solution:

One method for evaluating 0.04^{1,29} by using logarithms is as follows:

1. $\log 0.04 = \bar{2.60206}$

Next, add and subtract 10 to the logarithm to eliminate the negative characteristic.

2.
$$\log 0.04 = \overline{2.60206}$$

 $+ 10 - 10$
 $= 8.60206 - 10$
2. $\log 0.04129 = 1.20 \times \log 0.04$

3.
$$\log 0.04^{1.29} = 1.29 \times \log 0.04$$

= $1.29 \times (8.60206 - 10)$

It is at this point that our reader gets confused. He multiplies 8.60206-10 by 1.29 and gets 11.09666-12.9; the -12.9 term is not the familiar -10 term he is accustomed to handling. This confusion could have been avoided by adding and subtracting 90 to the results of Step 2 as follows:

$$4. \log 0.04 = 8.60206 - 10 \\
+ 90 - 90 \\
= 98.60206 - 100$$

5.
$$\log 0.04^{1.29} = 1.29 \times (98.60206 - 100)$$

= $127.19666 - 129$

6. Subtracting and adding 119 to get the familiar -10 term.

8. Antilog 8.19666 - 10 = 0.015727 by interpolation from a table of logarithms so that,

$$0.04^{1.29} = 0.015727$$

Instead of adding and subtracting 90 as was done in Step 4, there is another method whereby the familiar -10 term could have been attained. The multiplication indicated in Step 3 could be carried out to get 11.09666 - 12.9 as the log of $0.04^{1.29}$. Next 2.9 is subtracted and added.

$$-\frac{11.09666 - 12.9}{2.9 + 2.9}$$

$$-8.19666 - 10$$

which agrees with the result in Step 7.

Second Example: Find the value of $\sqrt[4]{0.00313}$

1.
$$\log 0.00313 = 7.49554 - 10$$

To make the negative part of the characteristic divisible by 4, 2 is added to and subtracted from the characteristic, giving:

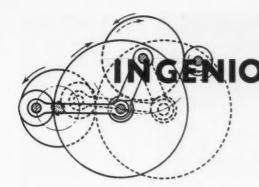
$$\log 0.00313 = 9.49554 - 12
\log \sqrt[4]{0.00313} = (9.49554 - 12) \div 4
= 2.37388 - 3$$

Adding and subtracting 7 to the characteristic gives:

$$+\frac{2.37388-3}{7-7}\\+\frac{7}{9.37388-10}$$

Antilog
$$9.37388 - 10 = 0.23653$$

Send in your interesting problem and its solution for presentation on this page



NIOUS MECHANISMS

Mechanisms selected by experienced machine designers as typical examples applicable in the construction of automatic machines and other devices

Indexing Movement that Starts without Shock

By PAUL GRODZINSKI, London, England

Most indexing mechanisms incorporate either cams, Geneva movements, or other components which present machining problems. An indexing mechanism made up of easily machined components and accurate gears that can be obtained from gear specialists is shown in Fig. 1.

This mechanism has the additional advantage of starting and stopping with zero initial acceleration. As shown in the displacement diagram,

Fig. 2, which was interpreted from a recorded graph, sections y_1 represent dwell periods of extended duration, while sections y_2 represent displacement movement.

The mechanism, illustrated in the top view of Fig. 1, is a planetary gear device incorporating two eccentrically located spur gears. The bore of each of these gears is machined off center by an amount equal to 20 per cent of its pitch radius. The desired dwell period is realized when the ratio of the number of turns of arm C to the number of turns of sun gear H is 3 to 1; that is, the arm must rotate three times faster than the sun gear, but in the opposite direction.

Drive-shaft A, which carries a 20-tooth pinion B, is keyed to arm C. Frame member D supports two pinions E and F, each having 20 teeth, which mesh with pinion B and also with internal gear G. This internal gear has 60 teeth and is integral with

an eccentrically located, 40-tooth sun gear H. Gears G and H revolve around shaft A.

Meshing with the sun gear is another eccentrically located, 40-tooth gear J. Mounted on the same shaft with gear J is a 20-tooth pinion K. This gear meshes with a 60-tooth gear L that is mounted on follower-shaft M.

In operation, drive-shaft A turns clockwise as indicated by the arrow; pinions E and F, internal

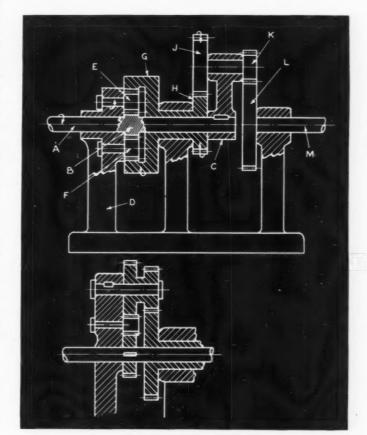


Fig. 1. (Top) Planetary gear type indexing device that provides fixed dwell periods in the movement of follower-shaft (M). (Bottom) Alternate gear arrangement permits the elimination of internal gear (G).

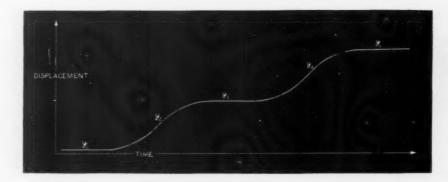


Fig. 2. Displacement diagram, interpreted from a recorded graph, shows dwell periods Y₁ and displacement movements Y₂.

gear G, and sun gear H turn counterclockwise, while gear J and pinion K turn clockwise. Since gear L is driven in a counterclockwise direction, follower-shaft M receives this motion. One full revolution of the drive-shaft results in several fixed dwell periods in the follower-shaft rotation.

An adaptation of the gear train to the left of sun gear H is shown in the lower view of Fig. 1. In this alternate arrangement only external spur gears are used, thus eliminating internal gear G. The gear ratio, however, remains the same (3 to 1).

Two Rotary Slides Reciprocated in Synchronism on a Single Shaft

By W. M. HALLIDAY, Southport, England

Two machine slides were required to rotate on a common shaft and, at the same time, to reciprocate along the shaft in opposite directions. A simple means had to be provided for altering the stroke length of both slides so that they could be adjusted to travel either equal or unequal distances, but with their reversal points occurring simultaneously. A mechanism incorporating these features is shown in the accompanying illustration.

Shaft A, shown at V, rotates slowly and carries the two machine slides B and C. The slides are forced to rotate with the shaft by means of keys D and E which are fastened to their respective members. A keyway F is machined along the length of the shaft to provide a sliding fit with the keys.

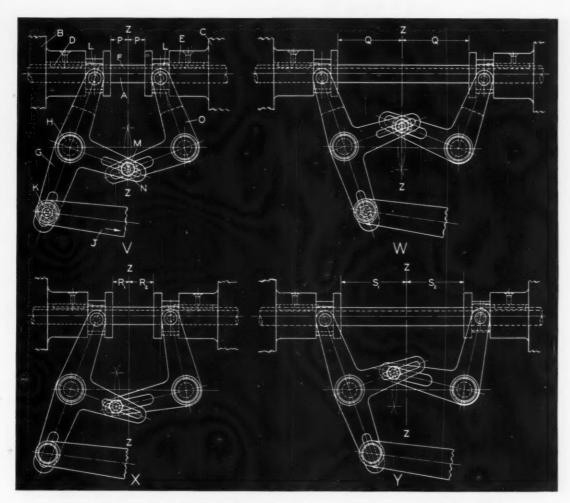
Reciprocating movements are imparted to slide B by T-shaped lever G, which pivots on stationary headed stud H. Connecting-rod J, providing the main source of motion, is free to pivot on stud K which connects it to the elongated slot at the lower end of the T-shaped lever. The length of the elongated slot is determined by the desired variation in stroke length of member B.

The upper end of lever G is forked to straddle a cylindrical extension boss on the end of slide B. Each arm of the fork is linked with an annular groove in the extension boss by means of a hardened steel trunnion block L. In this way, the machine slide is free to rotate at the same time that it is being reciprocated.

Centrally located with respect to stud H, in the integral right-hand, or short, limb of lever G, is an elongated slot. Mounted in this slot is headed stud M whose opposite sides are flattened slightly to prevent it from turning in the slot, yet allowing it to slide freely. The stud is secured to the limb by lock-nut N.

A larger diameter of stud M is a sliding fit within an elongated slot cut along the lower limb of bellcrank O. The bellcrank pivots on a stud similar to H. Both of these studs are located the same distance from shaft A, and the same distance each side of vertical axis Z-Z. The upper end of the bellcrank is forked, and is attached to slide C in the same way that lever G is attached to slide B.

The diagram at V shows the relative positions of the members when connecting-rod J is at its extreme left-hand position. With stud M locked in an appropriate position in the slot of lever G, and with the connecting-rod at its terminal point, slides B and C will be equidistant from vertical axis Z-Z as shown at P. As connecting-rod J moves to the right (arrow) on its return stroke, lever G will move counterclockwise, pivoting on stud H. This motion causes revolving slide B to move to the left. Similarly, bellcrank O will swivel in a clockwise direction, moving slide C to the right in unison with slide B. When connecting-rod J has reached the extent of its travel to the right, the two slides will still be equidistant from vertical axis Z-Z, as can be seen at W.



Adjustable lever type mechanism provides synchronous reciprocation of two opposed, rotating slides.

The illustration at X shows the position of the lever mechanism with connecting-rod J once again at its extreme left-hand position. In this case, stud M is set closer to fixed stud H, thereby conveying a smaller radial movement to the bell-crank. In this way, slide C will be moved through a shorter stroke than that imparted to slide B. The slides will, however, still move in unison, ending their sliding movements at the same instant, although at unequal distances from vertical axis Z-Z, as seen at Y.

Use of Aluminum Die-Castings Sets Record

Complete figures just released by the American Die Casting Institute indicate that the total diecasting production and sales in 1956 were exceeded only in 1955. While the output of zinc castings was 11 1/2 per cent under the 1955 all-

time high, aluminum, magnesium, and brass diecasting production set new high levels.

The total aluminum die-casting production was 367,250,000 pounds. In addition, the die-casters used almost 30,000,000 pounds of aluminum to make zinc die-casting alloy. This record consumption of aluminum by the die-casting industry amounts to 9.6 per cent of the total aluminum supply.

Zinc die-casting output was 362,500 tons, which represents 36.5 per cent of the total consumption of slab zinc. Magnesium die-castings, which totaled 6,200,000 pounds, and brass diecastings, amounting to 9,500,000 pounds, represent new production highs for these metals.

The total of 1956 job-shop die-casting sales was \$429,700,000. This covers the value of die-castings only; it does not include the cost of finishing or the sales of die-casting dies or special tooling. The additional value of such sales and services is estimated at over \$250,000,000.

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Enter as many articles as you like, but confine each to a single mechanism or movement.

what you do

Send a scale drawing (or photograph—or both) that shows the operating principle and important parts involved. Clear blueprints or pencil drawings are acceptable, but free-hand sketches cannot be used.

Describe the *purpose* and *action* of the mechanism—how it does what it does. Your description need not be in polished English, but it should be clear and logical.

Mark details on drawing, such as levers, cams, and gears, with letters A, B, etc., and use corresponding letters to identify those details in the description; thus, "Lever A is operated by cam B." (A suggestion: See how articles in this issue's "Ingenious Mechanisms" section are handled.)

Substitute a diagram for the drawing, if necessary, to illustrate the arrangement of a complicated mechanism.

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TOOL ENGINEERING Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

Gage for Adjusting Work-Rest on Centerless Grinding Machine

By WILLIAM Morson, Birkdale, England

One of the important factors to be considered in successful centerless grinding is the height setting of the work-rest. With many types of centerless grinding machines, this setting must be made by simple rule measurements. Ordinarily, these measurements are taken vertically from the upper edge of the work-rest to some stationary horizontal machine surface located above this site.

To expedite accurate work-rest adjustment, the gaging device shown in Fig. 1 will be found useful. Member A of the gage is a rectangular steel support bar that has been ground flat and parallel on all four sides. The length of the bar is determined by the size of the top surface of the regulating-wheel housing.

Fitting closely within a smooth bored hole in the forked, left-hand end of the support bar is the threaded shank of flanged sleeve B. Circular adjusting-nut C, which is a close fit within the accurately formed slot in the support bar, is

bored and tapped to engage the finepitch threads on the shank of the sleeve. Rotation of this nut thus raises or lowers the sleeve within the bar. Knurled circular lock-nut D is threaded onto the lower end of the

Sleeve *B* is bored concentrically to receive measuring rod E, which is a close fit therein. The rod is retained by means of set-screw F, which passes through the side wall of the sleeve head and bears against a flat that is machined on the side of the rod. This provision allows the rod to be adjusted to different positions within the sleeve.

A step, or ledge, is formed inte-

grally on the lower forked end of support bar A, projecting sufficiently to bring it in vertical alignment with the periphery of the flange on sleeve B. Micrometer measurements are taken from the upper surface of the flange to the lower surface of the projecting step; therefore, these two surfaces should be flat and parallel.

In application, support bar A is placed on the machined upper surface of regulating-wheel housing G, Fig. 2. This surface, on most centerless grinding machines, is convenient for gage location because of its proximity to the grinding

Measuring rod E should first be positioned within sleeve B so that a simple micrometer reading is obtained between the sleeve flange and the projecting ledge of the support bar (distance *X*) when the rod tip is on the grinding wheel center line. This datum dimension should be used as a constant from which to add or subtract when lowering or raising the measuring rod with

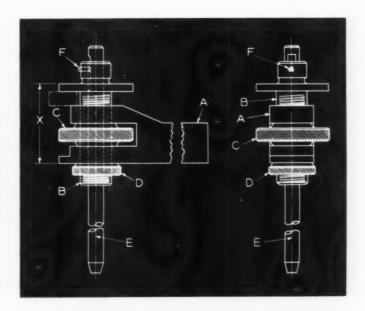


Fig. 1. Adjustable gage simplifies setting of work-rest on a centerless grinding machine.

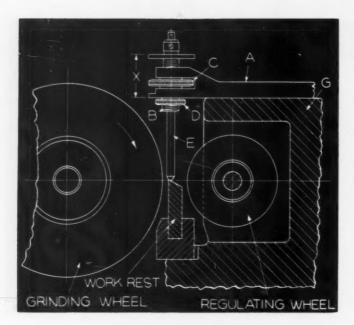


Fig. 2. Support bar (A) rests on machined top surface of housing (G) while measuring rod (E) gages the work-rest setting.

should be added to distance X. On the other hand, if the work-rest is to be located below the wheel center line, this amount should be subtracted from distance X.

In cases where a particular setting is repeated frequently, a suitable gage-block (shown in phantom lines, Fig. 1) can be made to fit between the upper surface of the support arm and the lower surface of the sleeve flange. Tightening lock-nut D will secure the setting.

The pre-set gage is placed on regulating-wheel housing G, as shown, with the end of the measuring rod lying immediately above one end of the work-rest. This member is then adjusted until its crest contacts the

measuring rod tip. The gage is then slid across the machine housing until it lines up with the opposite end of the work-rest, following which that end is adjusted to contact the measuring-rod tip. In this way, the work-rest is set in a true horizontal position at the required distance from the center line of the grinding wheel. By using a different setting at each end of the work-rest, it can be set to produce any desired taper on the work-piece.

respect to the grinding wheel center line. Setscrew F is then tightened so that the measuring rod and sleeve will move in unison during the gaging operation.

When this preliminary adjustment of the gage has been completed, nut C may be turned to move the measuring rod to the desired setting, either above or below the center line of the wheel. If the work-rest is to be located a certain distance above the wheel center line, this amount

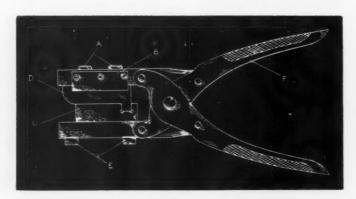
Parallel Jaw Plier Fitted With Drill Jig

By CLINT McLaughlin, Rockaway Beach, N. Y.

Small parts may be quickly clamped, drilled, and released when a drill jig is made integral with the jaws of a pair of parallel jaw pliers. Commonly available as hand punches, these pliers may also be purchased in a variety of sizes with blank jaws. The illustration shows a hand-

held drill jig made with one such pair of pliers as a basis.

The top jaw is machined to a press-fit with two drill bushings A. Locating members B and C are secured to the upper and lower jaws to position the work D accurately. Two small shoes E are



This hand-held drill jig is made from a parellel jaw plier. Larger bushings are accommodated by welding wider jaws in place. Springs in handles help to release work (D).

welded to the lower jaw and machined square with the work-locating surfaces. These surfaces provide a means of leveling and supporting the jig during the drilling operation.

In use, the handles F provide a quick means of clamping and positioning the work. Springs in the handles open the jaws to release the part

when the gripping pressure is released by the mechanic.

This type of drill jig may be adapted to a wide variety of small parts. When the jaws are too narrow to accommodate a bushing or accept the work locating members, both jaws can be cut off and wider ones welded in their place.

Fixture for Cutting Worm-Gears in a Lathe

By STANLEY P. GOULD, Porterville, Calif.

Worm-gears can be cut in a lathe with a singlepoint tool mounted in a boring-bar and held between centers. When using this method, the blank is secured to the compound rest by the device here illustrated. While not recommended as a manufacturing process, this fixture may prove useful in an emergency if no hob or mill is available.

Baseplate A, keyed on the bottom to fit the compound rest B, is secured in place by means of the screws C and clamping bar D. A boss E is tack-welded in position and tapped to receive index-screw F. The baseplate is then bored to a close turning fit with the lower end of bushing G. A nut H on stud J, tightened after each indexing, prevents the assembly from turning while the gear teeth are being cut.

Index-gear K and worm-gear blank L are made a tight fit on the bushing. However, spacing collar M should be a free fit. The index-gear must have the same number of teeth as required on the gear blank or a multiple thereof. The spacing collar is sized so as to position the center of the gear blank at the height of the lathe centers.

In operation, boring-bar *N* is mounted between centers in a lathe with form cutter *O* extended a distance that will give the proper radius to the

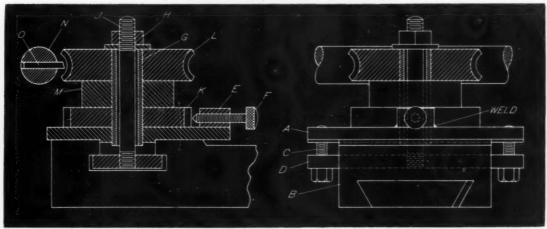
teeth of the worm-gear. A stop should be placed on the cross-slide, and the depth of cut adjusted by means of the compound feed. As the angle of a worm-gear tooth is 29 degrees, the compound rest can be set at 14 1/2 degrees and the roughing cuts taken on one side and bottom of the tooth space. This will save considerable time.

With the lead-screw of the lathe geared to the pitch required by the worm, cuts are taken by engaging the half-nut and allowing the gear blank to move past the revolving cutter. Several cuts may be taken before indexing for the next tooth. Finishing cuts should be taken by indexing around a second time, after all the teeth have been roughed out.

If the gear to be cut has a lead that can be accommodated by the thread-chasing dial, it may be used. In cutting any other lead the lathe must be left in gear and reversed.

A single U. S. rocket engine, now under development, produces more jet horsepower during its short running time than the total horsepower that can be developed by the giant Hoover Dam during the same period.

Fixture secures worm-gear blank (L) to the lathe compound. Teeth are cut by single-point tool (O) mounted in boring-bar (N).



LATEST DEVELOPMENTS IN



Pratt & Whitney Numerical Control System for Precision Machine Tools

The development of a highly accurate numerical control system for its line of jig borers, vertical hole grinders, and rotary tables has been announced by the Pratt & Whitney Co., Inc., West Hartford, Conn., a subsidary of Penn-Texas Corporation. The first of these units has been delivered to the Aircraft Engine Division of the Ford Motor Co., Chicago, Ill., for use in jet-engine production. The system provides the nearest possible approach to complete automation of these precision machine tools. It makes possible automatic, accurate positioning within one ten-thousandth of an inch, and machine tools that formerly could be used only as toolroom equipment can be made available for volume production purposes. All blueprint data needed for locating, indexing, boring, and grinding is stored on punched tape (see Fig. 1) and translated directly into mechanical action by the machine. The system actually feeds blueprint information directly to the machine, Fig. 2.

Features in this numerical control system include elimination of human error in reading or setting dials or verniers; provision for rapid setting of all slides and verniers simultaneously; reduction of scrap losses and consequently reduction in costs; increased operating speeds and efficiency; minimum setup time; constant precision, since the machine is automatically controlled; fewer jigs and fixtures required; and faster cycle times resulting from automatic operation.

Punched tapes are easily and economically prepared, and take the place of costly and complex fixtures. It is claimed that operator training periods can be substantially reduced, since this control system eliminates manual adjustments. All of the company's Series E jig borers, vertical precision hole grinders, and rotary tables are supplied with highly accurate Electrolimit measuring systems which are capable of settings that are accurate to 0.0001 inch, or 5 seconds of arc.

Pratt & Whitney's "Numerical Control" is based on the common decimal system (decimal of an inch and decimal of a degree of arc), and the dimensions shown on a blueprint are punched on tape as easily as numbers are tabulated on an adding machine. Thus, the necessity of making complex mathematical "translations" is eliminated. The tape reader utilizes a pneumatic sens-



Fig. 1. Digital information punched into tape (foreground) automatically operates Pratt & Whitney vertical precision hole grinder (background). Operator's control panel is shown at left.

210-MACHINERY, April, 1957

Equipment Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by Freeman C. Duston

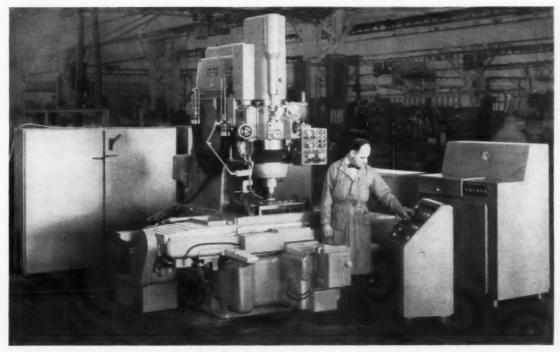


Fig. 2. Pratt & Whitney numerically controlled vertical precision hole grinder

ing system. Air is forced through holes in the tape to an enlarged chamber with a neoprene diaphragm which provides enough force to operate a limit switch. The tape is moved into position and stopped automatically. At the stopping point all data on the tape necessary for a single operation is read at one time and presented automatically to the machine. When the machine operation has been completed and checked, the tape can be advanced one block so that new information may be presented.

accomplished by means of a tape

Accurate longitudinal spacing is



Fig. 3. Numerical control automatically operates this Pratt & Whitney

vertical precision hole grinder in processing work shown in foreground

MACHINERY, April, 1957-211

punch which has a moving carriage. The tape can be clamped just before the block signal hole is punched, and the numerical data then inserted in the tape as the carriage is spaced along accurately by means of a rack and escapement. In addition to the tape control holes, a single block

may contain up to thirty-eight decimal digits of information. The Electrolimit measuring system uses a measuring bar which has accurately located magnetic lugs at 1-inch intervals combined with a micrometer screw for adding distances of less than 1 inch.

Circle Item 101 on postcard, page 255

dles arranged for presetting of cutting tools to minimize down time for tool changes; hardenedand-ground steel ways; central graphic control panel; and detector system in main console to signal and locate electrical failures instantly.

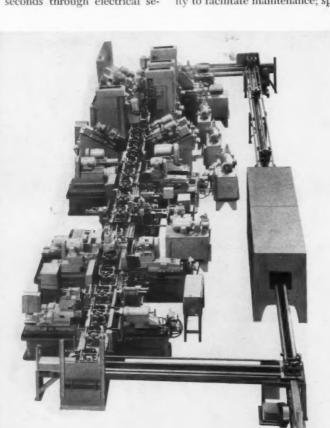
Circle Item 102 on postcard, page 255

Buhr "Economatic" for Processing Automatic Transmission Extensions

A twenty-five-station "Economatic" equipped to completely machine two different automatic transmission extensions at a production rate of 180 pieces per hour at 100 per cent efficiency has been announced by the Buhr Machine Tool Co., Ann Arbor, Mich. Parts to be machined are automatically positioned and clamped in palletized fixtures. Shifting from the processing of one part to another can be done in a matter of seconds through electrical se-

lectors. This transfer machine performs thirty operations, including drilling, tapping, rough- and finish-boring, automatic assembly of liners, automatic gaging, milling, and facing.

Noteworthy features of this machine include sectional base construction to facilitate future part changes; central mist-lubrication on all heads; automatic lubrication of all moving parts; standard and special parts interchangeability to facilitate maintenance; spin-



Twenty-five-station "Economatic" for processing automotive parts built by Buhr Machine Tool Co.

Heller Line of Hacksaws, Metal Band Saws, and Flat Die Steel

A major addition to its line of files has been announced by Heller Tool Co., Newcomerstown, Ohio. The three new lines are hand and power hack-saw blades, metal-cutting band saws, and flat ground die steel. These lines have been introduced as a result of the development of a steel-treating process, called "Job Tempering," which consists of the application of recent developments in tool metallurgy combined with unique heat-treating processes.

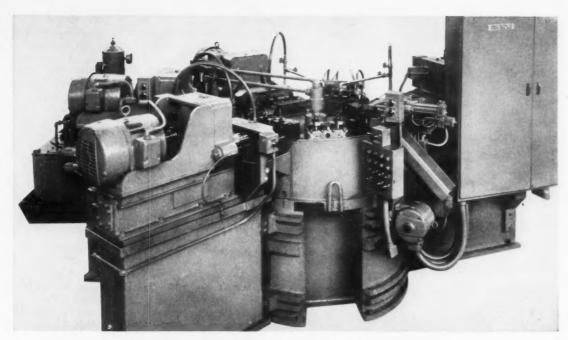
"Job Tempering" is said to produce tools of superior cutting quality that will withstand severe shop conditions. The new lines will include three types of hand and power hack-saw blades in all standard specifications, in both regular and high-speed steel types; hard edge metal-cutting band saws in all standard specifications; and some 1300 stock sizes of oil-hardening and air-hardening flat ground die steel.

Circle Item 103 on postcard, page 255

Turner Versatile Production Machine

A production machine said to be one of the most versatile in the machine-building field is being manufactured by Turner Bros., Inc., Ferndale, Mich. The machine is designed to perform all the operations on a variety of parts or products which ordinarily require the use of several machines. This is accomplished by building the initial machine from the manufacturer's standard components which can be added, subtracted, or rearranged as production requirements necessitate in switching from one job to another.

Each setup functions as if it



Production machine adaptable to a wide range of work built by Turner Bros., Inc.

were custom-designed to facilitate the production of a specific part, yet it is made up of standard Turner components that can be arranged to do many different production jobs. The machine is adaptable to simple or complex drilling, reaming, tapping, or milling operations.

Circle Item 104 on postcard, page 255

Loma Automatic Saw for Cutting Heavy Ingots

The Loma Machine Mfg. Co., Inc., New York City, has announced the development of an improved type hydraulic saw for cutting heavy ingots. The saw carriage of this machine travels on a cross beam above the ingot. It is claimed that this arrangement fully protects the moving parts such as motor, carriage, saw-blade and drive, from chips.

The design also incorporates features particularly helpful when cutting heavy ingots. The feed tables can be extended close to the saw blade; clamps are easily arranged on either side of the blade enabling short, last and first ends to be cut; and a mechanized chip conveyor can be placed below the saw blade for automatic chip re-

moval. The operator is protected from flying particles by being stationed behind the wide cross beam support where he can observe the cutting operation through a window. The entire operation cycle is remote-controlled, and all adjustments can be made from the operator's stand.

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Hydraulic saw for cutting heavy ingots made by Loma Machine Mfg. Co.



Thread checking gage announced by Sheffield Corporation

Sheffield Thread Checker

A gage for checking and indicating pitch diameters of any threaded part having external screw threads up to 1 1/2 inches in diameter and of specified pitch has been developed by the Sheffield Corporation, Dayton, Ohio. This instrument, which requires no special wires or attachments, can be quickly and simply operated mechanically to obtain pitch

diameter readings from 0 inch upward on a large, easily read dial having 0.0001-inch graduations. To achieve more precise measurements, the instrument can be adapted for use with Sheffield single-column Precisionaire air gages and Plunjet air gaging cartridges or with the company's new electronic "Accutron" amplifier and "Electrojet" pick-up unit.

The device uses one pair of gaging tips for each pitch to be checked. These tips have threaded shanks, are interchangeable, and available in sizes for checking virtually any pitch of any straight screw thread. A knob, conveniently located on the gaging head, enables the operator to select either a 16- or 40-ounce gaging pressure. Other gaging pressures are available to meet special requirements. Parts are rolled slowly into position between the gaging tips. Variations are read plus or minus from zero on the indicator dial. The setup is made from a master thread plug or part.

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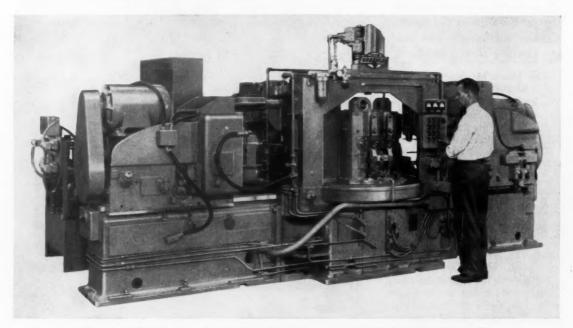
Greenlee Connecting-Rod Processing Machine

A machine for processing diesel engine connecting-rods at the rate of eighty-four rods per hour at 100 per cent operating efficiency is announced by Greenlee Bros. & Co., Rockford, Ill. This is a threeway, four-station, horizontal, automatic indexing machine. Fix-tures are manually loaded with two connecting-rods and are mounted on the index-table located at the first station. The two rods are then automatically clamped in position by a built-in, air-operated torque wrench. Premachined centers in each of the rods are used for endwise location in the fixture. The rods are then automatically indexed from station to station by a hydraulically operated gear-and-rack device.

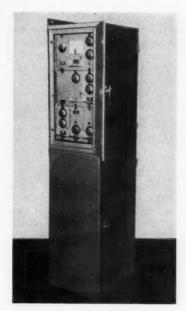
Wrist-pin holes are drilled and the cap side of the crankshaft hole is bored at the second station. The rod end of the crankshaft hole is bored and the bolt bosses are milled square at the third station. At the fourth station, the wrist-pin holes are semifinish-reamed while a sawing operation separates the cap from the rod.

This machine has a built-in hydraulic system for all stations (conforming to JIC standards), automatic lubrication, and chip disposal. All units are electrically interlocked.

Circle Item 107 on postcard, page 255



Three-way, four-station, automatic indexing machine announced by Greenlee Bros. & Co.



G-E three-tier, non-synchronous resistance welding control mounted above ignitron contactor enclosure

G-E Non-Synchronous Resistance Welding Control

A complete line of non-synchronous resistance welding control panels has been announced by the General Electric Specialty Control Department, Waynesboro. Va. This line is built to meet all NEMA performance standards and can be readily modified to meet JIC enclosure specifications. It features unitized plug-in control units, hermetically sealed relays and other long-life components, and standardized enclosures with swing-out frames.

The line combines the advantages of electronic control with the inherent benefits of hermetically sealed relays. The relays are designed to provide longer life and improved over-all performance in welding control, while the electronic unit timer eliminates the adverse effects of voltage fluctuations.

The "building block" technique of unitized plug-in control units to obtain maximum flexibility makes it possible to build custommade panels for any non-synchronous application, as well as panels for standard NEMA combinations. It also provides a simplified method of adding units to existing controls.

The basic unit is 4 inches wide by 8 1/2 inches high by 8 inches deep. All units have the same height and depth but vary in width from 4 to 12 inches, depending upon the space requirements of the individual unit. Enclosures for all ignitron contactors, standard or custom timers, and auxiliary controls—such as heat control and current regulators—have standard bases, 15 inches deep by 20 inches wide.

Circle Item 108 on postcard, page 255

Brown & Sharpe Automatic Screw Machine

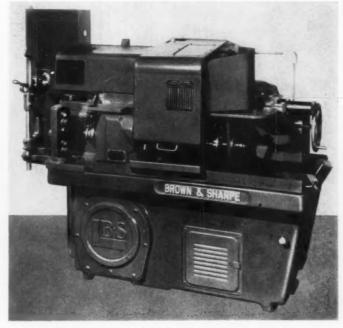
The Brown & Sharpe Mfg. Co., Providence, R. I., has announced a No. 2 automatic which is said to be faster and to have a higher sustained accuracy than any preceding machines of this type. It is available in three different capacities to take stock up to 3/4 inch, 1 1/4 inches, or 1 1/2 inches in diameter. For turning, forming, and one-chip finishing to 2 1/2-inch lengths (3 1/2 inches with lower drive-shaft speed), it is possible to consistently hold the work within limits of 0.0005 inch.

A wide range of eighteen high spindle speeds is available (16 on the 1 1/2-inch spindle) with a top speed of 5050 R.P.M. on the 3/4-inch capacity spindle; 3500 R.P.M. on the 1 1/4-inch spindle; and 2450 R.P.M. on the 1 1/2-inch spindle. For each high speed eleven or twelve low speeds can be used in combination, in ratios from 2.2:1 to 15:1. This exceptionally wide

choice of high- and low-speed combinations permits equally high cutting efficiency on materials ranging from tough alloy steel to free-cutting plastics and on the widest range of work diameters.

Selections of high and low spindle speeds are made by simple pick-off gears located in a single compartment. The spindle has a positive chain drive at all speeds. The spindle unit is of the removable, full anti-friction bearing type, with the end and radial play held to the absolute minimum.

Production rates range from 1 2/3 seconds to 480 seconds per piece—obtained by eleven change-gears. When operations required to produce the part permit, more than one piece can be made per cycle. The vertical slide has a quick-acting tool clamp. Holding the cut-off tool, it frees a cross-slide for additional tooling. A stopping device can be set to auto-



Brown & Sharpe high-speed automatic screw machine

matically and positively stop the drive-shaft when the last piece in the bar is completed. A warning light shows when the machine is

not producing.

The rapid pull-out mechanism, incorporated with the turret, gives greatly increased production on deep drilling operations where it is desired to withdraw the drill several times to clear the hole. With this arrangement, the drill is withdrawn and returned to the drilling position in one-half second, without indexing the turret. Operator motions are reduced to a minimum by the "Start" and "Stop" buttons provided for the spindle, and "Start" "Stop" and "Jog" buttons for the drive-shaft.

Minimum maintenance cost is assured by automatic lubrication and numerous safety devices. A spring safety device in the stock feeding mechanism prevents breakage in case of any interference with the advance of the reed tube. If the tool-slide mechanisms are subject to excessive stress, power to the drive-shaft is automatically shut off.

A wide range of attachments

can be used for performing additional operations or for doing second-operation work on one piece while the machine is engaged in the production of the next, or succeeding, piece.

Circle Item 109 on postcard, page 255

Huge Floor Type Horizontal Boring, Drilling, and Milling Machine

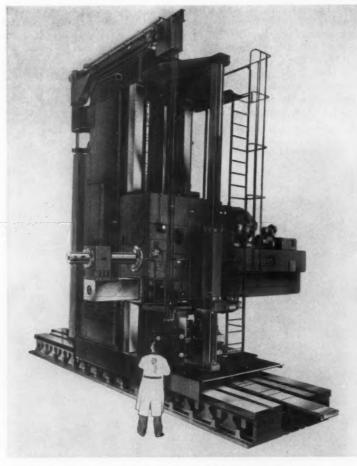
A giant-size, floor type horizontal boring, drilling, and milling machine with a 10-inch diameter spindle and an 18-inch square underarm has been manufactured by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. This precision machine weighs over 200 tons. The headstock alone weighs as much as a 60-passenger airliner. It is known as Model 1210-FUAR, is 27 feet high, and is said to be the largest existing machine of its kind.

The machine is available with either 10-, 12-, or 14-inch diameter spindle and is powered by a 100or 150-H.P. main drive motor. It can be furnished with vertical headstock and horizontal column travel to any desired specification. All-welded column of corrugated rib construction and welded steel base provide extra rigidity for the 42-ton headstock.

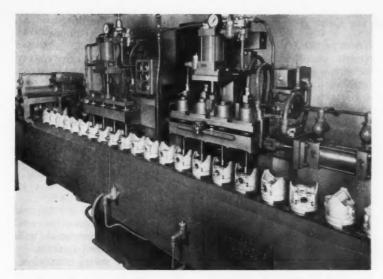
This huge, horizontal machine has an over-all spindle-speed range of 1.56 to 400 R.P.M. obtained through four back-gears and a 4 to 1 ratio adjustable speed motor. Two ranges of 0.002 to 0.5 inch and 0.5 inch to 120 inches per minute are provided for feed and traverse to the spindle and underarm. Infinite adjustment within each range is possible from the pendant station. Milling feeds to the column and headstock vary from 0.5 inch to 120 inches per minute over four gear ranges. Infinite adjustment within each range, as well as range selection, is accomplished from the pendant station.

The massive headstock houses the speed drive gears and helical bull gear capable of transmitting 15 H.P. All gears and shafts are mounted on anti-friction, heavyduty bearings. Electro-hydraulic clamps assure positive locking of the headstock to both of the flamehardened column ways.

The lubricating systems are designed to provide automatic lubrication to the gearing in the headstock and column base, the headstock ways, and the hydrostatic pads on the column base. Lubrication to the headstock and column base is provided only when these units are unclamped. The headstock and milling feed and drive units in the column base are lubricated by cascading oil over all moving parts. Oil from each system is used to provide a low-pres-



Giddings & Lewis giant-size horizontal drilling and milling machine



Automatic "Bearingizing" machine built by Hole Engineering Service for finishing piston-pin holes

sure hydraulic system operating at approximately 200 pounds per square inch for actuating the various clamps and shifting mechanisms. In every case, pressure switches interlock all of these functions. In addition to the 100-H.P. spindle drive motor, there are a column feed motor, head-stock feed motor, spindle feed, and traverse motor. Several smaller auxiliary motors and complete electric controls are provided to facilitate operation.

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Automatic Machine for "Bearingizing" Pin-Holes in Automobile Pistons

An automatic work-handling machine for sizing and finishing the pin-holes in automobile pistons has been designed and built by the Hole Engineering Service, Detroit, Mich. The work can be loaded into this machine with the head end down in a one-sided nest on the conveyor platens. The conveyor advances four pistons at a time with a 20-inch stroke, placing them first under a locating unit which rotates them so that the pin-hole is located at right angles to the conveyor.

At the next station, a holder is inserted between the pin-hole bosses, and four "Bearingizers" are passed through the pistons and withdrawn. Successive indexing

movements bring the pistons into position for unloading onto a continuous belt conveyor that carries them into an automatic weighing machine for sorting into three weight ranges. The cycle time is arranged to produce four pistons in eight seconds, with accuracy for size to 0.0002 inch and with a 5-micro-inch surface finish for the pin-holes.

Circle Item 111 on postcard, page 255

Drilling, Boring, and Spot-Facing Machine for Jet-Engine Part

The Avey Drilling Machine Co., Cincinnati, Ohio, has designed a machine for drilling, boring, and spot-facing the flanges and periphery of a jet-engine component. This machine has two horizontally mounted Aveydraulic units with 12-inch ram travel capacities. The third Avevdraulic unit, mounted vertically, has a 16-inch ram travel and a six-speed gear-box with a speed range of 150 to 1800 R.P.M. The vertical column has an in and out traverse of 20 inches and can be adjusted for drilling holes on bolt circles ranging from 15 to 55 inches in diameter.

The 60-inch Electrodex table is equipped with a master index ring with two rows of bushings, one row having ninety-six and the other forty-nine bushings, respectively. Two shot-bolt assemblies, coupled with a programming device, permit programming of the three heads to synchronize with the indexing movements of the table. The table and all units are push-button operated. The machine is built to JIC standards and state electrical codes.

Circle Item 112 on postcard, page 255



Avey drilling, boring, and spot-facing machine

Continuous Measuring Gage for Centerless Grinders

A continuous measuring gage for centerless grinding machines has been announced by the Federal Products Corporation, Providence, R. I. This Series 493-CG gage continuously measures the output of various types of centerless grinders and visually indicates any trend toward out-of-tolerance work so that as many as three or four machines can be supervised by a single operator.

In order for the gage to respond to work-piece size only—and ignore local irregularities such as spaces between work-pieces, oil holes, and annular grooves—a time delay response arrangement which is adjustable in accordance with the speed of work travel and piece length is provided. This device produces a steady, uninterrupted signal which clearly indicates the condition of the work.

Indicating limits can be set within the spread of the tolerance so that the operator will be signalled before any over-size or under-size work is produced. The indicating dial is graduated in 0.00005 inch, and the Air-Electric

system permits indicating limits to operate consistently within plus and minus five millionths of their established settings.

The gage is comprised of standardized components and is normally supplied with an air snap gaging head which can be equipped with spacing blocks to

suit a variety of work sizes. Alternately, it can be equipped with an air ring gaging head, as shown in the illustration. Both types of heads provide non-contact measurement which places no drag upon the work, thus avoiding the possibility of work pile up at the wheel which could cause serious damage.

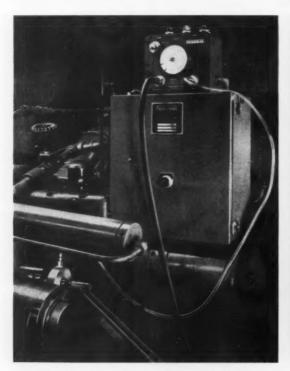
Circle Item 113 on postcard, page 255

Precision Spindles Equipped for Electrolytic Grinding

The Standard Electrical Tool Co., Cincinnati, Ohio, has announced that all their super precision spindles-motorized and independent drive type-are available with the accessories required for electrolytic (grinding) metal removal. The illustration shows an installation of the company's No. 2759Y super precision spindle with a Standard No. 1D feed and 360-degree graduated swivel type mounting base applied to the rail of a planer. The illustration also shows a stainless steel aircraft honeycomb part positioned on the planer bed. The grinding spindle has a 5-H.P. motor which operates

at a speed of 3600 R.P.M. and drives a 6-inch diameter metal plate wheel impregnated with abrasive or diamond particles.

Electrolytic metal removal involves the assembly of a (brush) slip ring on the back of the spindle for carrying the direct current through the spindle to the wheel, the wheel acting as the (cathode) negative pull, while the workpiece represents the (anode) positive pull. Assembled on the wheel end of the spindle is a sprinkler-spider of circular design with hose connection for spraying the electrolytic solution at the perimeter of the wheel. The wheel holder



Federal continuous measuring gage with air ring gaging head for centerless grinder



Planer equipped with spindle adapted for electrolytic grinding made by Standard Electrical Tool Co.

has an integral circular well with tangent holes arranged to carry the electrolytic solution in the

wheel recess, both serving to flood the work area.

Circle Item 114 on postcard, page 255

Automatic Mill for Cutting Germanium, Silicon, and Quartz

Milling of germanium, silicon, and quartz in the manufacture of oscillators and related electronic products is being accomplished on a special U. S. No. 1 milling machine built by the U. S. Burke Machine Tool Division, Cincinnati, Ohio. These completely automatic units are employed to "cut off" material to the proper size by using a diamond-impregnated rotating disc, supported on a revolving arbor.

The material is brought to the mill in the shape of a cylinder, generally not more than 5 inches long by 1 inch in diameter. This cylinder, or "boule," is first sliced into strips from 0.010 to 0.125 inch thick. Then these wafers are lapped, or etched, to their proper size and finish. This operation, termed "dicing," is usually done with a "gang" of blades on a single arbor.

After the first cut is made, the work-holding fixture is indexed 90

degrees, and the milling operation repeated. This produces a number of square pieces from each wafer. A typical sequence of operations performed automatically consists of downward feed of head; longitudinal feed of table; retraction of head and table; infeed of saddle; and descent of head. The cycle is automatically repeated until the entire boule is milled. Infeed of the saddle is accurately controlled from 0.001 to 0.150 inch per cut. The amount of feed can be adjusted to suit individual requirements.

Clear water is used as a coolant to prevent contamination and to assist in reclaiming the valuable chips. All efficient slicing operations require the use of copious quantities of coolant. Double coolant tanks can be furnished to permit filtering the returning liquid and to assist in reclaiming chips.

Circle Item 115 on postcard, page 255

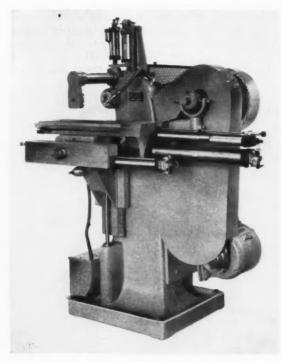
Clemco Wet Hone Machine

A wet pressure blasting machine, called the Clemco Wet Hone, is announced by Clementina, Ltd., San Francisco, Calif. Pressing a button serves to start agitation of the slurry immediately—regardless of the length of time it has remained idle or grain size of the abrasive used, which may range from 30 to 500 mesh. Pressure on a foot-lever starts the operation of cleaning, deburring, honing, or polishing. This varying

of the operation is accomplished by reducing or increasing the pressure setting on the regulator valve and changing the abrasive grain to suit.

A wide window and a foot-controlled window washer insure an excellent view of the work. The installation consists merely of attaching a 1-inch air line, 1/2-inch water line, and making an electrical connection between the machine and the shop wiring system.

Circle Item 116 on postcard, page 255



Mill built by U. S. Burke Machine Tool Division

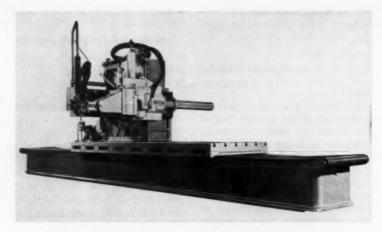


Wet hone machine brought out by Clementina, Ltd.

Arrow Three-Dimensional Profiling Machine

High-production, 360-degree profiling, three-dimensional contouring, and swarf or twist machining operations can be performed on steel, aluminum, or titanium work-pieces with the profiling machine which is being manufactured by the Arrow Engineering Co., Inc., Indianapolis, Ind. Using a highly responsive hydraulic tracing valve, the operator manually traces a template, and the cutting tool machines profiles or three-dimensional contours to size within 0.005 inch. For swarf or twist cuts, the spindle is mounted on arc-shaped ways, permitting the spindle to pivot 20 degrees either side of the vertical center line. The pivoting action of the spindle is actuated by a second tracing valve mounted on the cross carriage.

The machine is equipped with a 20-H.P., hydraulically powered spindle with speeds from 37 to 3000 R.P.M., giving it the necessary range and power to machine steel as well as aluminum and



Profiling machine manufactured by the Arrow Engineering Co., Inc.

titanium. Speed changes are made through pick-off gears, providing up to 30,000 inch-pounds of torque at 37 R.P.M.

The profiler table measures 42 by 144 inches and has a table travel of 136 inches. Table feed is from 0 to 40 inches per minute with a rapid traverse of 100 inches per minute. Six full-length T-slots provide for adequate clamping.

Circle Item 117 on postcard, page 255

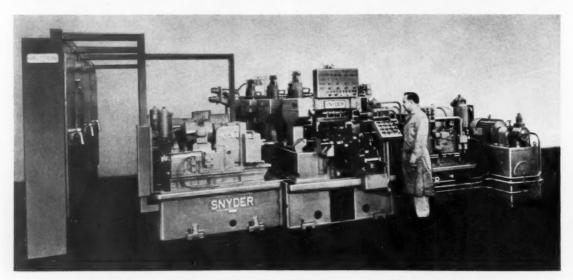
The transfer mechanism of this machine is of the walking-beam type, and the fixture is designed to bring the parts into accurate radial location for the machining operations. Tapped holes are reamed before tapping to provide maximum thread depth accuracy, as well as to assure concentricity of the holes with the center bore. Carbide tools are used for the boring, chamfering, facing, counterboring, and countersinking operations. Coolant is provided for all machining operations, including an oil mist spray for tapping.

The crankshafts are fed into the loading station by a transfer mechanism from the previous machining unit. The center holes in each end of the crankshaft are

Snyder Special Machine for Processing Crankshafts

A special thirteen-station, foursegment transfer machine for processing 112 forged steel or cast-iron crankshafts per hour has been built by the Snyder Tool & Engineering Co., Detroit, Mich.

This machine has been designed to perform drilling, boring, chamfering, reaming, and tapping operations with exceptional accuracy, especially with respect to the concentricity of tapped holes.

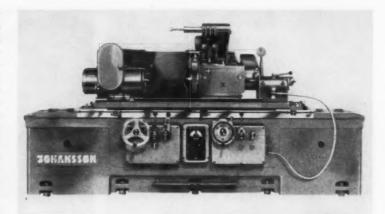


Snyder thirteen-station segmented transfer machine for use in crankshaft production line

drilled halfway to depth in the second station and to full depth in the third station. The precision center hole in one end is roughbored and faced in the fifth station while the hole in the other end is faced and chamfered. The precision center hole is finishbored and chamfered in the sixth station while the other center hole is counterbored and countersunk.

Six 3/8-inch holes are drilled in the flange in the eighth station and chamfered in the ninth station. These holes are reamed in the twelfth station. The six flange holes are tapped in the thirteenth station while a 5/8-inch hole is tapped in the center hole in the other end of the crankshaft.

The master control panel has push-button controls and indicator lights that show the operating



Johansson precision grinder introduced by Homestrand, Inc.

conditions of each segment. JIC standard electrical and hydraulic controls are utilized throughout.

Circle Item 118 on postcord, page 255

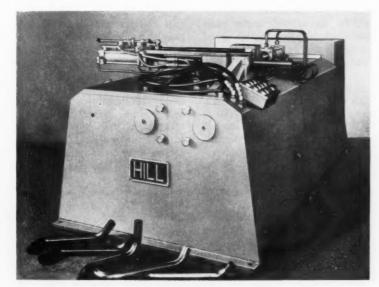
Press Type Bending Machine

High-speed bending of ferrous or non-ferrous tubular parts in which two or more bends of varying angles must be in accurate relationship can be accomplished on a press type bending machine announced by Walter P. Hill, Inc., Detroit, Mich. Accuracy of bend relationship is assured on this compact, horizontal type, hydraulic-powered machine by clamping one end of the tubular part and holding it stationary while a bend is produced on the other end by

the hydraulic press ram and wiper die assembly.

The hydraulic system is powered by a 30-H.P. motor, and a 40-gallon-per-minute pump operates the ram, mandrel, and wiping die cylinders. The die-clamping system is powered by a separate 2000-pound-per-square-inch hydraulic system powered by a 5-H.P. motor and a 3-gallon-per-minute pump. The machine occupies a floor space about 5 by 8 feet.

Circle Item 119 on postcard, page 255



Hill press bender that performs high-speed bending operations

Johansson Grinder

Homestrand, Inc., Larchmont, N. Y., is introducing in this country a Johansson precision grinder that is built in Sweden. This grinder is available in two types, the 2P designed for production and the 2U for toolroom and production use. It has a swing over the table of 14 inches and is available in center-distance capacities of 40, 60, and 80 inches.

The universal type takes grinding wheels 20 inches in diameter and up to 3 inches in width, whereas the production model takes wheels up to 30 inches in diameter 4 inches wide. The table travel is up to 236 inches per minute. The chuck holds work up to 9 inches in diameter and the maximum collet size is 1 1/2 inches. The headstock is of the gearless type, with twelve speeds, ranging from 20 to 320 R.P.M.

The wheel-head swivels to allow simultaneous diameter and end face grinding by profiled wheels. The headstock is rotatable through 360 degrees and can be used at either the right- or left-hand end of the table. The manual and automatic feeds may be operated simultaneously. The machine can be equipped with an electrical, hydraulic attachment which automatically switches from normal rate of feed to fine feed at a predetermined point. At the end of the fine feed period, a predetermined finishing run is initiated, after which the grinding support returns to its original position.

Circle Item 120 on postcard, page 255



Hydraulic tube-bending press announced by the Pines Engineering Co., Inc.



Precise "Super 80" heavy-duty power quill with electric speed control

Pines Hydraulic 6-Ton Tube-Bending Press

A vertical, ram type tube-bending press that can make two bends in each of two or more tubes and bend two different angles in the same U-frame is announced by the Pines Engineering Co., Inc., Aurora, Ill. The press, Model 6-T, incorporates a self-contained hydraulic system built for continuous production. It has a rated capacity of 6 tons and is designed so that the full ram tonnage is available for the bending action. Other outstanding design features include twin equalizing cushion cylinders, variable speeds and single adjustment for wing dies.

The press may be used for bending both steel or non-ferrous tubing. It has adequate power and capacity for continuous bending of steel tubing having an outside diameter of 1 inch, with a minimum ovalization in the bend. Excessive flattening and wrinkling is prevented. Provisions have been made for very accurate alignment of the dies. The wing die moves with the tube as it is wrapped around the ram die, eliminating the possibility of draw marks on

the tube. Four or more bends can be made with each stroke of the ram (two bends in each two or more tubes), making it possible to produce 1700 to 3000 bends per bour.

Circle Item 121 on postcard, page 255

Heavy-Duty Power Quill

A heavy-duty power quill, designated "Super 80," is the latest addition to the line of high-speed power quills made by Precise Products Corporation, Racine, Wis. This is a many-purpose tool which develops 1 1/2 H.P. at the quill and provides a continuously variable speed range from 7000 to 25,000 R.P.M. A compact electric control with a simple dial permits speed selection. The control has a voltmeter calibrated in revolutions per minute, master switch, pilot light, and a fuse for overload protection.

Specially designed mounts of either the universal or plain type permit easy mounting of the "Super 80" to larger standard machine tools such as milling machines, tool and cutter grinders, lathes, and surface grinders for

either single or multiple operations. A high-speed, universal motor, operated from a standard 115volt power supply, permits milling, grinding, or finishing to tolerances of 0.0001 inch.

Circle Item 122 on postcard, page 255

Portelvator for Feeding Cans to Conveyor Line

A Portelvator designed to feed cans to a conveyor at the rate of 13,000 per hour has been built for use in the Pittsburgh, Pa., plant of the H. J. Heinz Co., by the Hamilton Tool Co., Hamilton, Ohio. The Portelvator has a table area of 693 square inches, measuring 21 by 33 inches. It operates at a lift rate of 112 inches per minute from a minimum height of 24 inches to a maximum height of 40 inches.

This unit is employed to take over the job of feeding reserve cans to the conveyor system when the temporary shut-down of the can making machinery cuts off the regular direct supply line.

Cans are delivered from storage to the work station in paper cartons which are opened at the

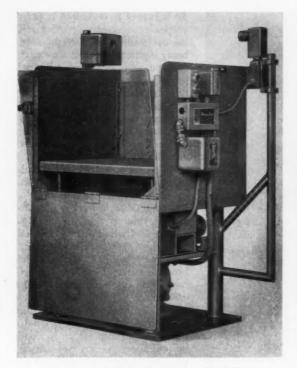






Fig. 1. Microhoning machine of versatile design

bottom and up-ended onto the Portelvator table at minimum height. The door of the Portelvator is then closed and the carton slipped out the top, leaving the cans stacked, tiers separated by paper sheets, ready for feeding into the conveyor.

One operator, using Portelvator, feeds approximately two cartons of cans per minute (360 cans), but feeds only as cans are needed in the conveyor.

Circle Item 123 on postcard, page 255

Versatile Microhoning Machine for Handling Internal and External Work

The Micromatic Hone Corporation, Detroit, Mich., has brought out a basic Micromatic "150" microhoning machine for handling both internal and external work, employing automatic stroking and hydraulic initial tool expansion and collapse as standard features. Packaged automation equipment, Figs. 2 and 3, is available.

Standard equipment furnished

with the basic machine includes: hydraulic initial tool expansion and collapse control; adjusting head for manual tool feed expansion and stonewear compensation; spindle mounted on hydraulically actuated reciprocating carriage with a 12-inch maximum stroke; variable-speed drive for spindle rotation; rigid work-table support; provisions for gravity coolant

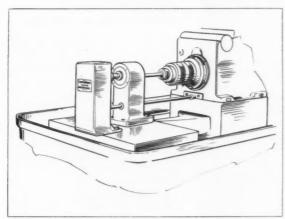


Fig. 2. Automatic sizing unit available as optional equipment for machine shown in Fig. 1.

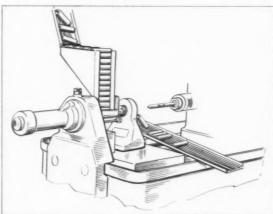


Fig. 3. Automatic work-handling equipment available for Micromatic "150" microhoning machine

drainage; and electrical equipment.

Optional equipment includes: micro-dial automatic hydraulic feed and stonewear compensation; automatic stonewear indicator and controls (used with micro-dial); automatic coolant separator, pump, and tank; and automatic sizing, Fig. 2 (gage plug or gage ring microsize control designed specifically to suit application).

Built as a horizontal type machine with a stationary bridge to accommodate work fixtures and optional equipment, this machine facilitates addition of automatic work-handling devices and also simplifies change-overs from one job setup to another. The spindle is mounted on a reciprocating carriage, hydraulically actuated, while the adjusting head is manually operated.

The maximum stroke is 12 inches and the maximum work diameter capacity, 1 1/2 inches. Height from the center of spindle to table is 5 inches, and the table is 17 inches wide by 16 inches long. Spindle rotation is by a variable-speed drive, and the reciprocation speed range is 0 to 60 surface feet per minute. The machine is 58 inches high, 34 inches wide, 52 inches long, and weighs approximately 3500 pounds.

Circle Item 124 on postcard, page 255

duction is 304 pieces per hour at 80 per cent operating efficiency, the cycle time including loading, being eighteen seconds. The part, in this case, is an automotive pawl for which the sequence of operations is: load two parts; drill four holes halfway through piece; drill through piece; chamfer both sides of the holes; ream; broach four surfaces on both parts in one pass; and unload work.

In operation, blanks are handfed, hand-clamped, and spring-located in double fixtures on the indexing table. Loading and unloading time is eight seconds. Indexing is hydraulically actuated through cam-controlled limit switches which also operate the broach-return mechanism. Accuracy of index alignment is within 0.0005 inch.

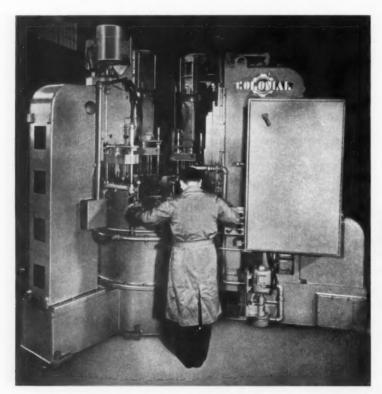
The hydraulic system of the broaching station is designed to offer a 40 per cent safety overload margin above the machine capacity. This minimizes shock and reduces vibration, besides giving reserve power when needed.

All station columns are of rugged construction using heavy side-plates and generous internal ribbing to insure machine rigidity. Drilling, chamfering, and reaming work-stations are standard electrically driven units designed for smooth operation and easy maintenance. All hydraulic and electrical controls are interlocked and installed in accordance with JIC standards.

Circle Item 125 on postcard, page 255

High-Speed Six-Station Drilling and Broaching Machine

A multi-station machine—believed to be the first of its type—is announced by the Colonial Broach & Machine Co., Detroit, Mich. In this machine, surface broaching is integrated with drilling, reaming, and chamfering operations to obtain high output and accuracy at low cost. This machine is essentially a combination of standard basic units and is adapted for use in the manufacture of many automotive, aircraft, business machine, and machine tool parts. It performs fourteen operations on each of two parts simultaneously. Pro-



Multi-operation machine developed by Colonial Broach & Machine Co.

Snap-In Nylon Bearings

A series of standard sizes of new type nylon bearings is being manufactured by Thomson Industries, Inc., Manhasset, N. Y. These bearings, known as Snap-In NY-LINERS, are designated Type 7. They have a flange on both ends which retains the bearing in a hole in sheet metal or thin plates of any material. One of the flanges has sufficient area to enable it to take thrust loads.

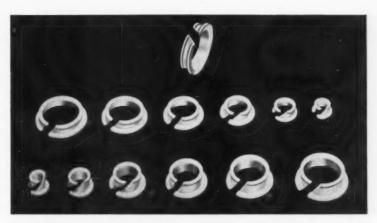
The bearings are provided with a helical split called a compensation gap which is equal in width to the expansion and contraction of nylon due to temperature changes and moisture absorption. This prevents changes in the bore diameter that would otherwise occur and therefore permits close fits of the shaft in the bearing. The gap also allows the bearing to be collapsed sufficiently to permit the anchoring flange to pass through the mounting hole. This snap-in action facilitates rapid and economical installation.

Standard Snap-In NYLINERS are manufactured in two lengths, one for plate from 0.040 to 0.075 inch in thickness and the other for plates from 0.072 to 0.135 inch thick. There are nine sizes of each, and the bore diameters range from 1/8 to 3/4 inch.

Circle Item 126 on postcard, page 255

DoALL Low-Priced Power Saw

The DoALL Co., Des Plaines, Ill., has announced a heavy-duty power saw—Model C-12—that has the power and rigidity required to utilize Demon high-speed steel saw bands. It is built to meet the needs of the tool and die shop, general machine shop, maintenance shop, and departments of



Thomson snap-in nylon bearings

large plants where an efficient, accurate, cut-off machine is required. The machine can handle work 12 by 12 inches and weighing up to 1500 pounds.

Setup and operation of this machine are extremely simple. The accuracy of cuts can be held to 0.002 inch per inch of diameter. Typical cutting rates are under two minutes for a 5-inch round bar of mild steel, five minutes for a 3 1/2-inch square of 18-8 stainless, and nineteen minutes for an

11 3/4-inch round of oil-hardening tool steel.

The same hydraulic system that provides band tensioning pressure is used to control the feed and to raise the sawing head. A conveniently located hydraulic valve controls rapid travel either up or down, a stop position, and a feed position. In the feed position, a calibrated, adjustable orifice permits the selection of any feeding rate down to 0. When the power is interrupted, the head is automatically locked in position—thereby preventing damage to the saw blade.

The machine uses a saw band 1 inch wide and 129 1/2 to 132 inches long which is powered by a 1 1/2-H.P motor through fourstep cone pulleys giving blade speeds of 90, 125, 180, and 250 surface feet per minute. The reservoir for the recirculating coolant system is built into the base of the machine. The coolant nozzle completely surrounds the saw blade, coating it and flooding the work with coolant. A screened chip drawer is provided for easy disposal of the chips.

The machine can be equipped with a 10-foot loading conveyor. If desired, this unit may be powered so that the twelve rolls are chain-driven for handling heavy work. The push-button reversing switch for the power table is located near the other controls on the base of the machine. A 42-inch discharge table with work-stop and coolant return is also available.

Circle Item 127 on postcard, page 255



Heavy-duty low-priced power saw announced by the DoALL Co.

Reid Automatic Surface Grinding Machine

A "Reid-O-Matic 824" completely power-operated surface grinder has been brought out by Reid Brothers Co., Inc., Beverly, Mass. This automatic machine is designed for both production and toolroom use and will handle work-pieces up to 8 by 24 inches. Dial-controlled table speed is variable from 5 to 75 feet per minute in infinitely fine increments. Crossfeed drive is dial-controlled for adjustments from 0.001 to 0.125 inch, and a selector switch controls cross-feed at either or both ends of the table travel. All pushbutton controls are contained in a single station, located at finger-tip level on the right side of the grinder.

Table traverse is through an electric clutch transmission which runs in an oil bath. A variable-speed direct-current motor drives two clutches; at the end of each stroke a reversing switch de-energizes one clutch and energizes the other, reversing the direction of rotation. The table is connected by a timing belt drive to the transmission. A low-pressure automatic lubrication system is provided for constant oiling of all way surfaces.

A 2-H.P. cartridge type motorized spindle is mounted in the

head. The grinding wheel mounted on the spindle is 12 inches in diameter and operates at a speed of 1800 R.P.M. Electrical controls are mounted in a sealed cabinet in the base. The elevating handwheel has a slip ring for zero resetting and vernier for adjustment in 0.0001-inch increments. Ball-bearing mounting provides easy operation. Other features include: crossfeed selector buttons, automatic or hand table traverse, and full power control of all adjustments.

The Reid-O-Matic operates on 220 volts, three-phase, 60-cycle current but can be furnished for use on 440- or 550-volt current. The machine requires a floor space 93 by 51 1/2 inches and weighs 4000 pounds. The worktable is 66 by 10 1/4 inches overall with an 8- by 24-inch working surface and a 15-inch clearance under the wheel.

Circle Item 128 on postcard, page 255

Sheffield-Cavitron Ultrasonic Machine

A portable, bench type Sheffield-Cavitron ultrasonic machine tool for surface grinding and plunge-cutting hard, brittle materials was demonstrated by the Sheffield Corporation, Dayton, Ohio, at the Western Metal Exposition.

This machine is approximately 20 by 20 by 27 inches. It consists of a sturdy cast base on which is mounted a sliding work-table, work chuck, and a vertical slidemounted transducer that converts high-frequency sound energy to mechanical energy. The machine is powered by a caster-mounted 200-watt electronic generator. The ultrasonic tool has a capacity for cutting material 1/2 inch in diameter in one cut and may be adjusted vertically through a 3-inch feed range by means of a handwheel.

The T-slotted work chuck has a 6- by 8-inch capacity. The work-table has a cross-slide travel of 6 inches and a longitudinal travel of 8 inches. A portable ultrasonic hand tool can also be used with the electronic generator for cutting, polishing, and profiling hard and brittle materials.

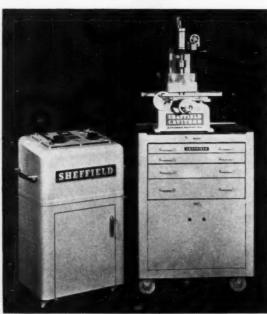
Circle Item 129 on postcard, page 255

Versatile Drill Press

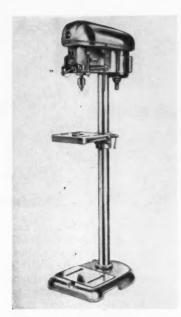
A low-cost, 14-inch Delta drill press designed for commercial woodworking and metalworking shops has been introduced by the Delta Power Tool Division, Rock-



"Reid-O-Matic" power-operated surface grinder



Portable Sheffield-Cavitron ultrasonic machine



Drill press built by Delta Power Tool Division, Rockwell Mfg. Co.

well Mfg. Co., Pittsburgh, Pa. The streamline, counterbalanced belt guard of this machine is hinged at the rear and can be swung up and out of the way where it is suspended automatically like the lid of a car trunk. This feature facilitates cleaning and belt changing.

A pivoting type motor-mounting plate permits quick release of the belt tension to facilitate speed changing. After changing the speed, a spring-loaded plunger automatically restores the correct operating tension on the belt.

The quill allows a spindle travel of 4 5/16 inches. Spindle-return tension can be easily adjusted. The work-table has slots and clamping ledges at the sides to facilitate clamping work in place.

The machine is designed to accommodate a push-button starter as an accessory where centralized, up-front controls are desired for easier operation. The starter button is recessed to prevent accidental starts by brushing against it, while the stop button is installed in a protruding position. Other features include balanced pulleys, self-aligning drive, and interchangeable spindles.

Circle Item 130 on postcard, page 255

High-Speed "Flexopress"

A 200-ton, high-speed "Flexopress" with speeds up to 250 strokes per minute is being produced by the Precision Welder & Flexopress Corporation, Cincinnati, Ohio. This press, fitted with an eight-station progressive die, can be operated at the rate of 150 strokes per minute with a 4-inch stroke. It is claimed that vibration has been eliminated to such an ex-

tent in this machine that a coin will remain balanced on edge on the bolster during a production run.

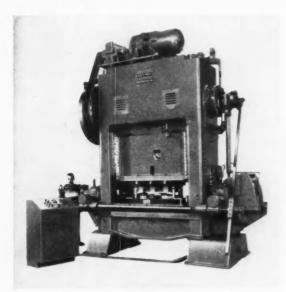
The slide is fitted with four preloaded ball bearing raceways. The bottom of the ram is parallel to the bed within 0.0005 inch. Equipment includes an air friction type clutch and scrap cutter and double feed rolls designed for accurate stock feeding. The machine has an all-steel frame, welded and keyed with four tie-rods. Power is furnished by a 25-H.P., variablespeed motor with console control.

Circle Item 131 on postcard, page 255

Deep-Hole Drilling Machine

The Lahr Machine & Tool Corporation, Toledo, Ohio, is introducing a deep-hole drilling machine. It is claimed that this machine will drill to a depth of 24 inches with a maximum drift of only 0.001 to 0.0015 inch per foot of depth—depending on the quality of the work-piece. The drill spindle operates over a 36-square-foot area without resetting the material. Rapid indexing controls eliminate layout and drill jigs.

Accuracy and drilling speed are obtained by using a single-flute gun drill with provisions for a coolant-wash combination. This feature permits continuous pene-



High-speed "Flexopress" brought out by the Precision Welder & Flexopress Corporation



Deep-hole drilling machine brought out by the Lahr Machine & Tool Corporation

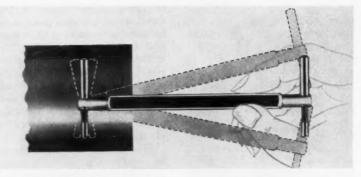
tration without retraction for clearing chips. Holes can be drilled to a diameter tolerance of plus or minus 0.001 inch and a No. 6 micro finish. The drill spindle, with an integral direct-current motor, is adjustable within a range of 300 to 5000 R.P.M.

Circle Item 132 on postcard, page 255

Adjustable Hole Gage

A "Go" and "Not Go" internal gage, called "Holojust," has been introduced by the George Scherr Co., New York City. This adjustable hole gage is of very simple construction, as shown in the illustration. It is used as an adjustable limit plug gage and will check the bore diameter, as well as outof-roundness and bellmouth in any spot and any depth, depending on the length of the handle, up to approximately 5 inches. Bores located one behind another. of equal or unequal diameters. can be checked with extraordinary accuracy. Holes requiring micro finish can be inspected without leaving marks. A full set of gages will cover a total range from 7/16 inch to 2 5/16 inches.

The gage handles are made of aluminum to assure light weight and to provide sensitive feel. The most outstanding advantage of this gage is the ease of adjusting it accurately and securing the setting to any limits by means of micrometers or gage-blocks.



"Holojust" adjustable hole gage announced by George Scherr Co., Inc.

The ends of the handles are colored for identification, the "Go" end being green and the "Not Go" end, red. A dovetail slot, cut lengthwise in the handle, accommodates an interchangeable strip of black anodized aluminum on which dimensions and part numbers can be stamped.

Circle Item 133 on postcard, page 255

Gear-Motors with Double-Enveloping Worm-Gearing

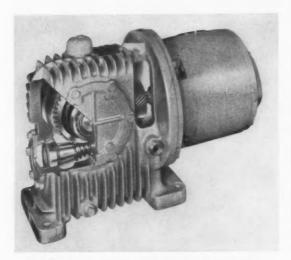
Compactness, high capacity, and long life, resulting from the use of double-enveloping worm-gearing, are features of a complete new line of right-angle worm gear-motors available from Cone-Drive Gears, Division Michigan Tool Co., Detroit, Mich. These gear-motors are offered in both standard extended shaft and shaft-mounted models.

Standard NEMA D-flange motors are used and gear-motors are available with or without motors. Four different sizes are available to handle fractional to 15-H.P. motors. This range is being extended to 40-H.P. All Cone-Drive gearmotors are available in twenty-eight standard output speeds from 6.25 to 525 R.P.M. (which includes all standard A.G.M.A. output speeds) in both extended shaft and shaft-mounted models...

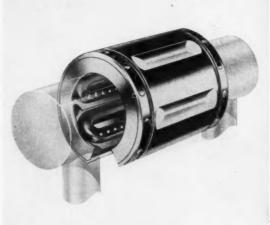
Circle Item 134 on postcard, page 255

Open Type Linear Ball Bearing for Shafts

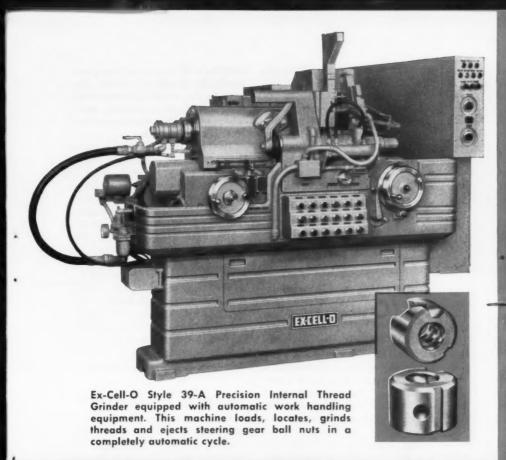
A linear ball bearing that permits the use of shaft support members along the length of the shaft traversed by the bearings has been developed by Thomson Industries, Inc., Manhasset, N. Y. These bearings—known as open



Cone-Drive gear-motor showing construction features



Thomson open type ball bushing for supported shafts





EX-CELL-O STYLE 33 FOR EXTERNAL THREADS: An accurate production machine, automatic except for loading, unloading, and moving the cycle lever. Can be arranged for tapered grinding and for eccentric relief grinding.



EX-CELL-O STYLE 36 FOR LONG EXTERNAL THREADS, also available with internal attachment. A high production machine with easily adjusted work cycles.

Short Runs, High Production, or Automation with Ex-Cell-O Thread Grinders



EX-CELL-O STYLE 50: A versatile machine for external work . . . also available with internal attachment.

These standard machines are grinding thread gages, machine tool lead screws, innumerable aircraft parts, automotive steering mechanisms and pinions, worms, taps, and many similar workpieces.

Precision thread grinders in this Ex-Cell-O line range from manuallyoperated models, for toolroom and for short runs, to high production automatics, to styles equipped with automatic work handling equipment. There are five models designed to meet your every requirement.

For specific information, call your local Ex-Cell-O representative.



MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAIL-ROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT



EX-CELL-O STYLE 120: Our largest Thread Grinder, Grinds 10 feet of thread in one setting. Accommodates 12 feet of stock between centers.



type ball bushings—are recommended for use where extreme rigidity or unusually long shafts are a requirement.

The open construction of the bearing permits adjustment of bore diameter by use of set-screws or other clamping arrangements for a smooth free-running line-to-line or slight pre-load fit. The very low friction practically eliminates wear, but should it eventually develop under heavy loads, any play can be easily removed by read-

justment of the bearing bore diameter.

The ball bushings do not depend on the maintenance of an oil film; hence, their use eliminates the difficulties which result from contamination or deterioration of exposed oil films and inaccuracies which result from oil film thickness variations. They are manufactured to standard dimensions for shafts ranging from 1 inch to 4 inches in diameter.

Circle Item 135 on postcard, page 255

Baldwin Compacting Press

A versatile compacting press with multiple motions has been developed by the Hamilton Division of Baldwin-Lima-Hamilton Corporation, Hamilton, Ohio. The welded steel frame of the press supports the die set on all sides, applying its own rigidity to the working parts, including the upper ram, floating die-holder, and ejection mechanism, each of which is a unit assembly.

The press has a rated pressure capacity of 30 tons and can easily

be equipped in the field with accessories such as an independent floating core rod support for the forming of blind or counterbored holes. Other accessories—all packaged and fitting into place without machining of any kind—include a cushion cylinder to operate a secondary top punch; pre-pressing die control; dual-ejection mechanism; and precision indicators for adjustments.

The driving speed is variable, ranging from 10 to 40 strokes per

minute. Although designed principally for powdered metals, the press is also useful in compacting complicated cross-sections with other powdered materials, such as ceramics and carbides.

The head stroke is 6 3/4 inches, the same as the opening between the bottom of the top punch and the top of the die (maximum daylight). Ejection capacity of the machine is 20 tons, and the ejection stroke is adjustable up to 4 1/2 inches. The depth of the fill is adjustable up to 41/2 inches, and the die opening is 10 inches. Power is furnished by a 5-H.P., totally enclosed, fan-cooled motor. There are push-buttons for starting and jogging. The press has a shuttle type feeder and is equipped with an automatic lubrication system.

Circle Item 136 on postcard, page 255

Production Honing Machine

A vertical type production honing machine with a capacity for handling work up to 4 inches in diameter and 12 inches in height



Compacting press developed by Hamilton Division, Baldwin-Lima-Hamilton Corporation

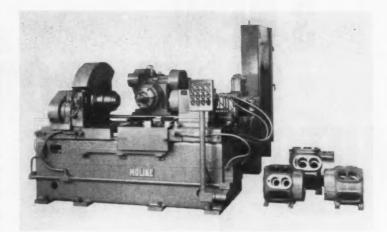


Vertical type production honing machine developed by the Superior Hone Corporation

has been announced by the Superior Hone Corporation, Elkhart, Ind. The speed of the V-belt-driven spindle is infinitely variable from 225 to 550 R.P.M. Adjustable limit switches control the stroking lengths. Jogging switches on the control panel provide for honing in any section of the part without resetting the limit switches.

The ground table is adjustable in four ways for squareness. The 3-inch ground guide bars are mounted on the fabricated steel base which houses the coolant reservoir, pump, and oil filter tray, as well as the hydraulic reservoir and pump. Stone pressure is set by a valve and pressure dial.

A 440-, 220-, or 110-volt machine tool transformer is provided. Electric current to all switches and controls, other than the three motors, is 110-volt. The machine is



Moline compressor crankcase boring machine

84 inches high, 40 inches wide, and 52 inches long.

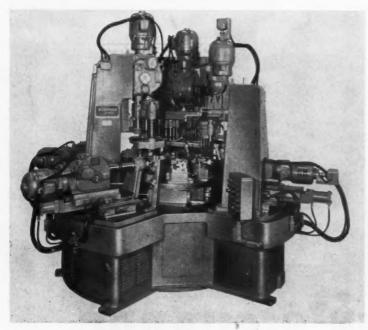
Circle Item 137 on postcard, page 255

Six-Station Machine for Processing Gear Housings

A six-station horizontal indexing, drilling, and boring machine has been built by the Hartford Special Machinery Co., Hartford, Conn., to bore, face, hollow-mill, drill, and tap three different castiron gear housings.

Five cam-teed drilling units and two lead-screw tapping units are employed to process the parts. Horizontal units are provided with side adjustment to handle left-hand parts. The loading fixture consists of interchangeable, manually operated clamping nests. Production is 256 parts per hour at 100 per cent efficiency.

Circle Item 138 on postcard, page 255



Machine built by Hartford Special Machinery Co. to process gear housings

Boring Machine for Compressor Crankcases

A Model MR149 boring machine designed for boring two different sizes of 4-, 6- and 8-cylinder compressor crankcases to receive cylinder sleeves has been brought out by the Moline Tool Co., Moline, Ill. This single-spindle machine features completely automatic operation once the part is loaded into the fixture. The horizontal boring spindle unit is traversed by hydraulic power on hardened and ground steel ways and is provided with rapid traverse in two directions.

After a crankcase is loaded into the fixture, it is located and clamped endwise by hydraulic power. The automatic cycle is then started, causing the boring and indexing operations to follow a pre-set sequence until completed.

Just as soon as the tools are withdrawn at completion of work on a bore, the crankcase is indexed longitudinally and radially as required to bring the next hole into position for boring. After all holes have been bored, the fixture indexes the work into position with feet down, ready for unloading. Operations include rough bore, counterbore top and bottom bores, and face bottom bores. Changeover from one size crankcase to another can be conveniently accomplished in a matter of minutes.

Circle Item 139 on postcard, page 255 (This section continued on page 234)

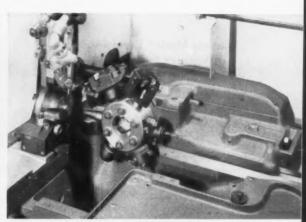
3 NEW SUPER-PRODUCTIVE AUTOMATICS



BROWN & SHARPE



Super-Precision spindle with antifriction bearings reduces radial and thrust play to an absolute minimum. Powerful, positive chain drive delivers full power at all speeds, giving maximum tool life on all materials.

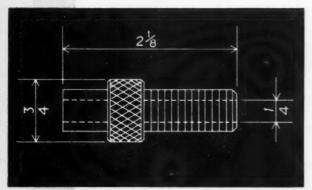


Super-Precise hardened and ground steel ways and cross slides maintain lasting, precise alignment with spindle . . . permit consistent dimensional accuracy to 0.0005" and longer tool life.

Three New No. 2 Automatic Screw Machines

on stock up

to 11/2" diameter



COMPARE PRODUCTION TIME FOR THE ABOVE PART

OMI ARE PRODUCTION	TIME FOR THE	MOOVE PART
	Seco	nds Per Piece
	Brass	B-1113 Steel
revious Design Machine	15	120
lew No. 2	11	671/2

SAVINGS 36% in Brass 76% in Steel Like the famous Brown & Sharpe "00" introduced two years ago, the new Brown & Sharpe No. 2's now offer accuracy and economy far ahead of any other automatic in their range! Three different machines for $3\frac{1}{4}$ ", $1\frac{1}{4}$ ", or $1\frac{1}{2}$ " stock . . . easier set-ups . . . as much as 80% faster production . . . consistently closer tolerances on stock ranging from free machining materials to high alloy steels!

Here are just a few reasons for this superperformance: Spindle speeds up to 20% higher. Turning capacity increased to 3½" length. Exclusive rapid pull-out arrangement is standard equipment . . . keeps drill-end clean and cool, vastly speeds up deep drilling. Full 1" adjustment on turret for convenience of operators and cam designers. Integral vertical slide provides permanent extra tool position. All control by push button. For better results on all precision production write for full details on these advanced automatics. Brown & Sharpe Mfg. Co., Providence, R. I.

B·S

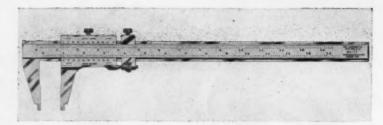
Brown & Sharpe

MILLING, GRINDING, AND SCREW MACHINES . CUTTERS MACHINE TOOL ACCESSORIES . PRECISION TOOLS . PUMPS

Starrett Master Precision Vernier Caliper

A caliper, developed by the L. S. Starrett Co., Athol, Mass., called the Starrett No. 123 satin chrome master-vernier caliper, has a number of features designed to improve accuracy; provide easier, faster setting and reading; and assure greater rigidity and longer life.

Long 50-division vernier scales with widely spaced, easy-to-read graduations are used to simplify setting and reading without the use of a magnifying glass. Both vernier plates fit flush with the main scale, thus eliminating reading errors due to parallax. The open-face design also permits



Master precision vernier caliper developed by the L. S. Starrett Co.

placing both the inside and outside vernier scales on the same side of the tool. The caliper is held and read exactly the same for inside and outside measurements. It is available in 12- and 24-inch sizes, graduated in thousandths.

Circle Item 140 on postcard, page 255

Hydraulically Controlled Tube Cut-Off Machine

A hydraulically controlled tube cut-off machine that operates automatically or semi-automatically has been brought out by the Tube Cut-Off Machine Co., Flint, Mich. A tube to be cut, when placed in the feed-rolls of the machine, advances through the die to the tube stop which it compresses. This actuates the hydraulic cylinder, causing the die to close, the horizontal blade to make the initial cut, and the verti-

cal blade to complete the cut. Then the stop pulls off the tube, the cylinder action reverses, the tube stop returns to its original position and the die opens.

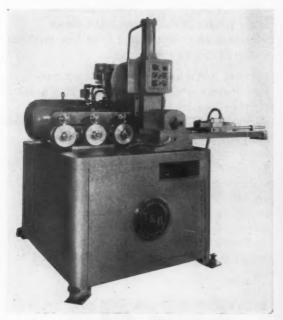
Cutting is done without distortion of tube. Pieces are cut-off to the exact length within tolerances of plus or minus 0.005 inch. A 2-inch length of tubing can be cut off in one second. Tubes with wall thicknesses ranging from 0.010 to 0.100 inch can be handled. Material of any shape for which dies can be made, up to an outside diameter of 2 inches, can be cut-off. Machines of larger capacity can also be made to special order. The machine is available in either a right-hand or a left-hand style.

Circle Item 141 on postcard, page 255

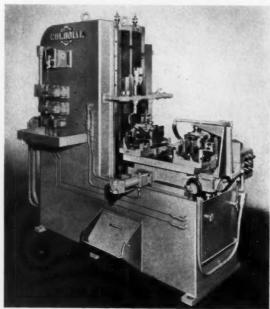
Ram Press Broaching Machine with Indexing Table

A ram press surface broaching machine with built-in indexing table has been developed by Colonial Broach & Machine Co., Detroit, Mich. Most models of the Colonial ram press line can be supplied with the new integrated table. The automatic table has a 180-degree indexing movement, is

(Continued on page 240)



Automatic tube cut-off machine



Colonial ram press surface broaching machine

that quality Look tells you they're CINCINNATI Sliding Head Drills

even better than their appearance, is their performance!

umn Floor Drill. Single or multiple spindles.11/2" drillcapacity

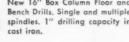
These new Cincinnati-engineered Sliding Head Drills give you the capacity, ease of operation, high accuracy and rigidity of drilling machines that cost far more!

Features: New geared power feeds . . . new depth dial with positive stop and automatic feed disengage . . . new massive spindle, extra rigid . . . new motor drive . . . new electrical controls . . . new unit construction of column and frame . . . new tables and bases . . . new standards of accuracy.

You'll speed up and improve your drilling machine operations by replacing all of your outmoded drills with these new, economicallypriced Cincinnatis. See them and test them at your local CL&T dealer. Write direct for catalog data. Cincinnati Lathe and Tool Co., 3207 Disney St., Cincinnati 9, Ohio.

> New 21" Round Column Flo Drill. Single spindle only. 11/2" drilling capacity in cast iron.

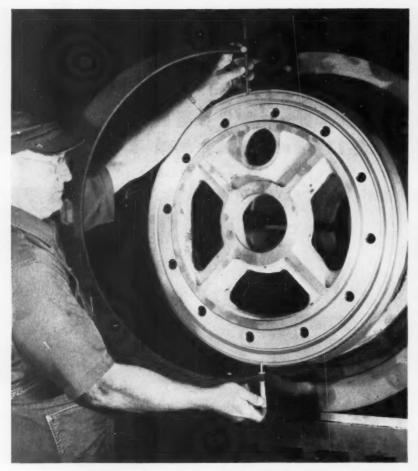
New 16" Box Column Floor and Bench Drills. Single and multiple spindles. 1" drilling capacity in cast iron.





cincinnati lathes and drills

Builders of Engine, Toolroom and Fixed Gap Bed Lathes and a complete line of Drilling Machines





Ever notice how your best men insist upon Starrett Tools at the crib... and won't take anything but Starretts when they buy tools for their own kits? The reason is obvious... Starrett Tools sharpen their skill—make it easier to be accurate.

You'll find the Starrett name on a complete line of precision-made

products — precision measuring tools, dial indicators and gages, steel tapes and rules, hacksaws, hole saws, band saws, band knives and precision ground die and flat stock. And Starrett Tools are always available through a convenient and reliable source of supply...your local Industrial Supply Distributor.

BIG NEW CATALOG NO. 27

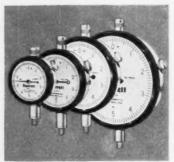
Describes and illustrates the complete Starrett line. Ask your Industrial Supply Distributor or write for free copy. Address Dept. D. The L. S. Starrett Company, Athol, Massachusetts, U. S. A.



SINCE 1880 WORLD'S GREATEST TOOLMAKERS HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
WIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
MACKSAWS • MOLE SAWS BAND SAWS BAND KNIVES



MECHANICS' HAND MEASURING TOOLS
AND PRECISION INSTRUMENTS
More than 3000 fine tools for every
precision measuring need.



DIAL INDICATORS AND GAGES
Made to meet the highest standards of
precision performance for every quality control need.



HACKSAWS, HOLE SAWS, BAND SAWS AND BAND KNIVES

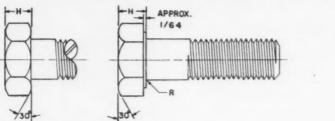
Precision made and production proved for top performance, uniformity and maximum cutting economy.



PRECISION GROUND DIE STOCK AND FLAT STOCK

Now over 1000 sizes — air, oil, oil and water and water hardening types. "Just lay it out and saw it out."

AMERICAN STANDARD FINISHED HEXAGON BOLTS





Siz	ninal e or Major	Body Diameter Min. (Maximum		dth Acros Flats F	is	Width / Com G	ers		Height H		Rad of Fi	llet
	neter	Equal to Nominal Size)		ax. sic)	Min.*	Max.	Min.	Nom.	Max.	Min.	Max.	Min
5/16 3/8	0.2500 0.3125 0.3750 0.4375 0.5000	0.2450 0.3065 0.3690 0.4305	7/16 1/2 9/16 5/8	0.4375 0.5000 0.5625 0.6250	0 428 0 489 0 .551 0.612	0.505 0.577 0.650 0.722 0.866	0.488 0.557 0.628 0.698	5/32 13/64 15/64 9/32 5/16	0.163 0.211 0.243 0.291	0.150 0.195 0.226 0.272	0.009 0.009 0.009 0.009	0.023 0.023 0.023 0.023
9/16 5/8 3/4 7/8	0.5625 0.6250 0.7500 0.8750	0.5545 0.6170 0.7410 0.8660	13/16 15/16 1 1/8 1 5/16	0.8125 0.9375 1.1250 1.3125	0.798 0.922 1.100 1.285	0.938 1.083 1.299 1.516	0.910 1.051 1.254 1.465	23/64 25/64 15/32 35/64	0.371 0.403 0.483 0.563	0.348 0.378 0.455 0.531	0.021 0.021 0.021 0.021 0.041	0.041 0.041 0.041 0.062
1 1 1/8 1 1/4 1 3/8	1.0000 1.1250 1.2500 1.3750	0.9900 1.1140 1.2390 1.3630	1 1/2 1 11/16 1 7/8 2 1/16	1.5000 1.6875 1.8750 2.0625	1.469 1.631 1.812 1.994	1.732 1.949 2.165 2.382	1.675 1.859 2.066 2.273	39/64 11/16 25/32 27/32	0.627 0.718 0.813 0.878	0.591 0.658 0.749 0.810	0.062 0.062 0.062 0.062	0.093 0.093 0.093
1 1/2 1 3/4	1.5000 1.7500	1.4880 1.7380	2 1/4 2 5/8	2.2500 2.6250	2.175 2.538	2.598 3.031	2.480 2.893	15/16	0.974 1.134	0.902 1.054	0.062	0.093
2 2 1/4 2 1/2 2 3/4 3	2.0000 2.2500 2.5000 2.7500 3.0000	1.9880 2.2380 2.4880 2.7380 2.9880	3 3 3/8 3 3/4 4 1/8 4 1/2	3.0000 3.3750 3.7500 4.1250 4.5000	2.900 3.262 3.625 3.988 4.350	3.464 3.897 4.330 4.763 5.196	3.306 3.719 4.133 4.546 4.959	1 7/32 1 3/8 1 17/32 1 11/16 1 7/8	1.263 1.423 1.583 1.744 1.935	1.175 1.327 1.479 1.632 1.815	0.062 0.062 0.062 0.062 0.062	0.093 0.093 0.093 0.093

• In sizes 1/4 to 1 inch, a tolerance of minus 0.050 D may be used when the product is hot-made.

All dimensions given in inches.

BOLD TYPE indicates products unified dimensionally with British and Canadian standards.

"Finished" in the title refers to the quality of manufacture and the closeness of tolerance and does not

indicate that surfaces are completely machined.

Taper of head (angle between one side and axis) shall not exceed 2 degrees, specified width across flats being the

largest dimension.

Top of head shall be flat and chamfered. Diameter of top circle shall be maximum width across flats within a tolerance of minus 15 per cent.

Bearing surface shall be flat and either washer-faced or

with chamfered corners. Diameter of bearing surface shall be 95 per cent of maximum width across flats within a

be 95 per cent of maximum width across flats within a tolerance of plus or minus 5 per cent.

Bearing surface shall be at right angles to axis of body within a tolerance of 2 degrees for sizes up to and including 1 inch and within a tolerance of 1 degree for sizes larger than 1 inch. The bearing surface shall be concentric with axis of body within a tolerance of 3 per cent of the maximum width across flats.

Minimum thread length shall be twice the diameter plus 1/4 inch for lengths up to and including 6 inches; twice the diameter plus 1/2 inch for lengths over 6 inches. The tolerance shall be plus 3/16 inch or 2.1/2 threads.

The tolerance shall be plus 3/16 inch or 2 1/2 threads, whichever is greater. On products that are too short for minimum thread lengths, the distance from the bearing surface of the head to the first complete thread shall not exceed the length of 2 1/2 threads, as measured with a ring thread gage, for sizes up to and including 1 inch and 31/2 threads for sizes larger than 1 inch.

Thread shall be coarse-, fine-, or 8-thread series, Class

2A for plain (unplated) bolts. For plated bolts, the diam-

eters may be increased by the amount of Class 2A allowance. Thickness or quality of plating shall be measured or tested on the side of the bolt head. Point shall be flat and chamfered from approximately

1/64 inch below the minor diameter, the length of point to be from 1/2 to 1 1/2 threads.
Tolerance on bolt length for sizes up to and including

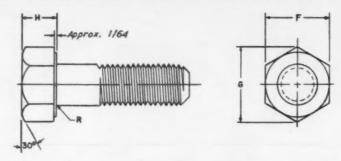
Tolerance on bolt length for sizes up to and including 3/4 inch shall be: minus 1/32 inch for lengths up to and including 1 inch; minus 1/16 inch for lengths over 1 inch to and including 2 inches; minus 3/32 inch for lengths over 2 inches to and including 6 inches; and minus 3/16 inch for lengths over 6 inches. Tolerance for sizes over 3/4 inch shall be: minus 1/16 inch for lengths up to and including 1 inch; minus 1/8 inch for lengths over 1 inch to a displaying 2 inches; and minus 3/16 inch for up to and including 2 inches; and minus 3/16 inch for lengths over 2 inches.

Total runout (eccentricity and angularity) of thread in relation to body: for sizes up to and including 3/4 inch, bolts shall screw at least two threads into a tapped hole counterbored for 1/32-inch diametral clearance over the maximum body diameter to a depth equal to the length of the bolt less one bolt diameter. The starting thread of the tapped hole shall be countersunk to the diameter of the counterbore. The tapped hole shall have a Class 2B maximum pitch diameter, and the inspection fixture shall be hardened. For bolts over 3/4 inch the diametral clearance of the counterbored hole shall be 1/16 inch.

Unless otherwise specified, physical properties of steel bolts shall correspond to SAE Grades 2 or 5. Bolts may also be made from alloy steel, brass, bronze, corrosion-resisting steel, aluminum alloy, or other specified material.

Extracted from American Standard Square and Hexagon Bolts and Nuts (ASA B18.2-1955), with the permission of the publisher, the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

AMERICAN STANDARD HEAVY FINISHED HEXAGON BOLTS



Si	minal ze or	Body Diam, Min. (Max. Equal		th Acros Flats F	s	Width Corr			Height H			lius illet
Dia		to Nominal Size)	M	lax. asic)	Min.	Max.	Min.	Nom.	Max.	Min.	Max.	Min.
1/2 5/8 3/4 7/8 1 1/8 1 1/4 1 3/8 1 1/2 1 3/4	0.5000 0.6250 0.7500 0.8750 1.0000 1.1250 1.2500 1.3750	0.6170 0.7410 0.8660 0.9900 1.1140 1.2390 1.3630	7/8 1 1/16 1 1/4 1 7/16 1 5/8 1 13/16 2 3/16 2 3/8 2 3/4	0.8750 1.0625 1.2500 1.4375 1.6250 1.8125 2.0000 2.1875 2.3750 2.7500	0.850 1.031 1.212 1.394 1.575 1.756 1.938 2.119 2.300 2.662	1.010 1.227 1.443 1.660 1.876 2.093 2.309 2.526 2.742 3.175	0.969 1.175 1.383 1.589 1.796 2.002 2.209 2.416 2.622 3.035	13/32 1/2 19/32 11/16 3/4 27/32 15/16 1 1/32 1 1/8 1 5/16	0.426 0.522 0.618 0.714 0.778 0.874 0.970 1.065	0.386 0.478 0.570 0.662 0.722 0.814 0.906 0.997 1.089 1.272	0.031 0.062 0.062 0.062 0.093 0.093 0.093 0.093 0.093	0.009 0.021 0.023 0.031 0.062 0.062 0.062 0.062
2 2 1/4 2 1/2 2 3/4 3	2.0000 2.2500 2.5000 2.7500 3.0000	1.9880 2.2380 2.4880 2.7380	3 1/8 3 1/2 3 7/8 4 1/4 4 5/8	3.1250 3.5000 3.8750 4.2500 4.6250	3.025 3.388 3.750 4.112 4.475	3.608 4.041 4.474 4.907 5.340	3.449 3.862 4.275 4.688 5.102	1 7/16 1 5/8 1 13/16 2 3/16	1.482 1.673 1.864 2.056 2.248	1.394 1.577 1.760 1.944 2.128	0.125 0.188 0.188 0.188 0.188	0.07 0.12 0.12 0.12 0.12

All dimensions given in inches.

BOLD TYPE indicates products unified dimensionally with British and Canadian standards.

"Finished" in the title refers to the quality of manufacture and the closeness of tolerance and does not indicate that surfaces are completely machined.

Taper of head (angle between one side and axis) shall not

exceed 2 degrees, specified width across flats being the largest dimension

Top of head shall be flat and chamfered. Diameter of top circle shall be maximum width across flats within a tolerance

circle shall be maximum width across flats within a tolerance of minus 15 per cent.

Bearing surface shall be flat and washer-faced. Diameter of washer face shall be 95 per cent of maximum width across flats within a tolerance of plus or minus 5 per cent.

Bearing surface shall be at right angles to axis of body within a tolerance of 2 degrees for sizes up to and including 1 inch; and within a tolerance of 1 degree for sizes larger than 1 inch. The bearing surface shall be concentric with axis of body within a tolerance of 3 per cent of the maximum width across flats.

Minimum thread length shall be twice the diameter plus 1/4 inch for lengths up to and including 6 inches; twice the diameter plus 1/2 inch for lengths over 6 inches. The tolerance shall be plus 3/16 inch or 21/2 threads, whichever is greater. On products that are too short for minimum thread lengths, the distance from the bearing surface of the head to the first complete thread shall not exceed the length of 21/2 threads, as measured with a ring thread gage, for sizes up to and including 1 inch and 31/2 threads for sizes larger than 1 inch.

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than 1 inch.

Thread shall be coarse-, fine-, or 8-thread series, Class 2A for plain (unplated) bolts. For plated bolts, the diameters may be increased by the amount of Class 2A allowance. Thickness or quality of plating shall be measured or tested on the side of the bolt head.

Point shall be flat and chamfered or rounded at manufacturer's option, length of point to first full thread not to exceed 1 1/2 threads.

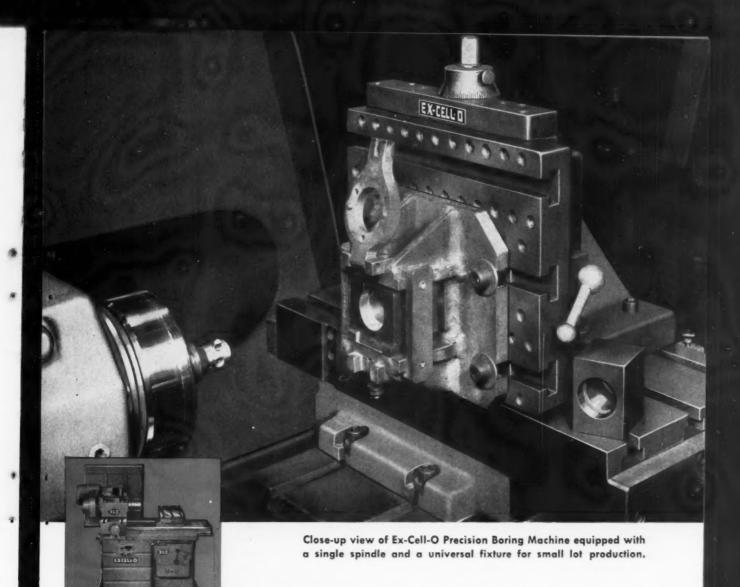
Bolt		Bolt Length To	lerance for Bolt Size, I	nches
Length, Inches	1/2	5/8 & 3/4	7/8 to 1 1/4	1 3/8 & Over
1 to 2 Over 2 to 6	± 1/32 ± 1/16	±1/16 ±3/32	± 3/32 ± 3/32	± 1/8 ± 3/16
Over 6	± 3/32	±3/32 ±1/8	± 3/16	± 1/4

Maximum deviation of bolt shank from the surface plate on which it is rolled for inspection shall be 0.0020 inch per inch of length.

Suitable material for steel bolt is covered by Tentative Specification for Steel Machine Bolts and Nuts and Tap Bolts

of the American Society for Testing Materials (ASTM A-307); suitable material for high-strength steel bolt is covered by ASTM Tentative Specification for Quenched and Tempered Steel Bolts and Studs with Suitable Nuts and Plain Washers (ASTM A325).

Extracted from American Standard Square and Hexagon Bolts and Nuts (ASA B18.2-1955), with the permission of the publisher, the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.



These versatile machines keep busy

Ideal machines for toolroom work and short production runs

These Ex-Cell-O Precision Boring Machines equipped for general-purpose work perform precision boring, turning, facing and chamfering operations quickly and economically.

They can be operated automatically or manually. Spindle speeds are easily changed through variable speed

drives. Universal fixtures rigidly hold tools and workpieces of many sizes and shapes. Horizontal and vertical slides of the fixtures permit precision positioning of either tools or work.

Ex-Cell-O makes a complete line of versatile precision boring machines.

EX-CELL-0

FOR



DETROIT 32. MICHIGAN MANUFACTURERS OF PRECISION MACHINE TOOLS . GRINDING SPINDLES . CUTTING TOOLS RAILROAD PINS AND BUSHINGS . DRULL JIG BUSHINGS . AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS . DAIRY EQUIPMENT

2112-B single-end Ex-Cell-O Precision **Boring Machine**

with horizontal cross slide fixture.

1212-8 double-end

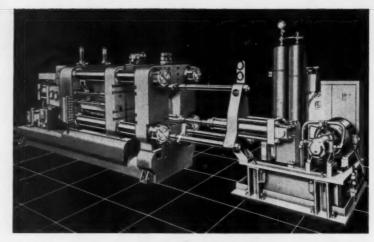
Ex-Cell-O Precision **Boring Machine** with universal fixture having cross and vertical slides.

manually fed, and automatically unloaded. Features include: selflocking of the fixture by the indexing action; precision alignment; and high performance.

The new machine with built-in index broaches 1200 rocker-arm assemblies an hour. These particular parts are loaded two at a time, automatically clamped, double broached in one pass, and automatically ejected. The cycle time, at 100 per cent efficiency, is six seconds. This machine has a capacity of 4 tons and a stroke of 24 inches. Other models in the line have rated capacities of 6 and 10 tons. Automatic loading and transfer type installations are available.

Precision Cam-Generating Unit for Shop Use

A precision, cam-generating unit, called the "Gen-A-Cam," developed to facilitate laying out and generating plate-cams in any machine shop is announced by the Steuby Mfg. Co., St. Louis, Mo. The unit can be used with either a milling machine or surface grinder. It will generate plate-cams with accurate and constant rises. Hardened cams can be reshaped, and soft cams that have been worn from the heavy pressure of cam-rollers can be restored.



Improved die-casting machine brought out by the Hydraulic Press Mfg. Co., Division of Koehring Co.

The unit will generate lobes of any size, including lobes having two or more rates of rise on one lobe to obtain two or more rates of feed for any tool. It operates without the use of change-gears, vet it is claimed that it will produce cams that are accurate with an infinite selection of rates of rise from 0.000 inch (dwell) to 0.100 inch rise per hundredth of cam surface. (Graduations in degrees or hundredths optional). A layout attachment is available which allows quick and accurate scribing of cam blanks.

Circle Item 143 on postcard, page 255

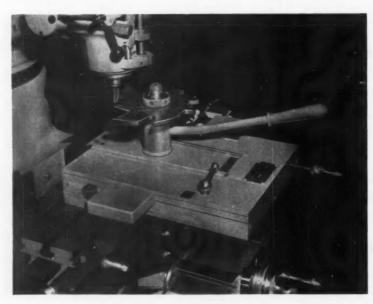
H-P-M High-Pressure Die-Casting Machine

The Hydraulic Press Mfg. Co., Division of Koehring Co., Mount Gilead, Ohio, has announced an improved line of high-pressure, cold chamber die-casting machines—available in 200-, 400-, 600-, and 800-ton capacities. Many refinements have been made in both the self-contained clamp and injection ends to obtain outstanding performance. Pre-load rated tonnages and superior die locking on press overloads have been proved by tests with a newly developed 800-ton hydraulic load cell.

The heavy central screw adjustment is motorized and push-button operated. Improved locking reduces "wear and tear" on dies and maintains close casting dimensions. The refined injection end, in addition to the rugged clamp, has made possible production of the most difficult castings with a minimum of "cut and try" on gates, vents, and overflow.

With maximum plunger speeds available and positive pressure follow-through from the pump without hesitation, porosity problems, surface finish and "fill" difficulties have been practically eliminated. Provisions are made for recording pressures and the operation of press cycle controls to facilitate making repeat setups. All possible safety features are available.

Circle Item 144 on postcard, page 255 (Continued on page 242)



"Gen-A-Cam" precision cam-generating unit made by Steuby Mfg. Co.



LOW, WIDE and HANDSOME

... it's the largest of its kind in the world

This is the largest mechanical underdrive press in the world. It is 40 feet long, 20 feet above floor level, 22 feet below, and has a capacity of 2400 tons.

And what a job it does! At the Reading, Pa., plant of Parish Pressed Steel Company, it stamps out 20-foot-long auto chassis side rails from thick hot-rolled steel blanks... two per stroke, sixteen per minute. Or, by using the cushion be-

tween the openings in the uprights, it produces 30-foot-long truck chassis rails.

Like Parish, many a firm is shifting to underdrives wherever it can. Their low silhouette fits into one-story plants. And with the entire drive "down under"—below the working floor — maintenance becomes simpler and faster. It's the modern press for the modern plant. In other words, it's Bliss,



100 years of making metal work for mankind

E. W. BLISS, COMPANY, Executive Offices, Canton, Ohio Presses · Rolling Mills · Mill Rolls · Can Machinery · Die Sets · Ordnance



Fig. 1. Cutler-Hammer oiltight "Roto-Push" operator unit



Fig. 2. "Pres-Test" indicating light made by Cutler-Hammer, Inc.

Cutler-Hammer Oiltight Push-Buttons

Cutler-Hammer, Inc., Milwaukee, Wis., has announced two lines of oiltight push-buttons. The "Roto-Push" operator unit, Fig. 1, combines the functions of a single-button station with the advantages of a two- or three-position selector switch in one unit. Contacts are maintained or momentarily operated by turning the guard ring, depressing the button, or a combination of both.

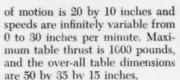
The "Pres-Test" indicating light, Fig. 2, provides a simple means of checking indicating lights without disturbing the control circuit and without removing a lens or bulb. This entire line of oiltight pushbuttons requires a depth of only 1 23/32 inches in back of the panel for the transformer types and 1 7/8 inches for the resistor units.

They are available in key-operated, selector switch, flush button, mushroom head, or knob-operated models, each utilizing a durable, neoprene diaphragm seal for complete oiltightness.

Circle Item 145 on postcard, page 255

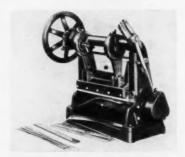
Work-Positioning Table with Magnetic Tape Control

A fully automatic work-positioning table for use with existing machine tools having automatic spindles has been announced by the Allison Equipment Co., Santa Monica, Calif. The motion of this table is controlled by magnetic tape along two axes located at 90 degrees to each other in a horizontal plane. Travel at 45-degree angles to these axes is produced by electrically connecting the two axes during recording. The range



Control switches provide for stopping the sequence while machining and for automatic restarting. The system uses 1/2-inch magnetic tape on which seven channels of information are recorded. Four of these produce the table motion; one stops the tape during machining; one controls the spindle movements of the machine to which the table is attached; and one rewinds the tape.

Circle Item 146 on postcard, page 255



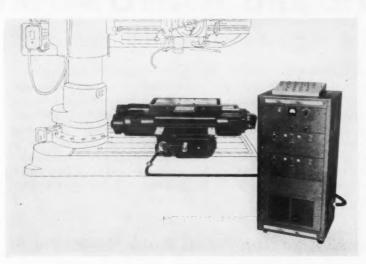
Automatic shear announced by Jaco Devices, Inc.

"Autogil" Automatic Shear

An automatic, guillotine type shear, designed to cut coils or rolls of materials quickly, cleanly, and with unvarying precision, is announced by Jaco Devices, Inc., Quincy, Mass. This shear will cut exact lengths of coiled materials such as felt, fibers, foil, film, insulation, neoprene, leather, plastics, paper, rubber, tapes, textiles, webbing and wire.

The shear is made in three models to accommodate materials 5, 12, and 15 inches wide, and up to 3/16 inch thick, depending on the hardness of the stock to be cut. The maximum length capacity of all models is 96 inches. After setting length of cut, the machine is completely automatic in operation and will shear 120 pieces per minute until the roll of material is exhausted or, if equipped with an electric "Predetermined Counter," will shear until desired quantity has been cut off the roll.

Circle Item 147 on postcard, page 255



Allison work-positioning table with magnetic tape control

no other lathe shifts as easily and quickly as...

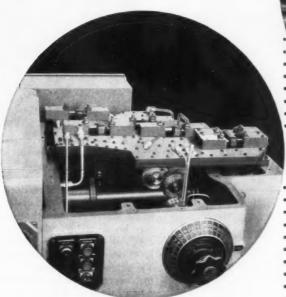
SIDNEY DIAL-MASTER LATHE

MODEL 32

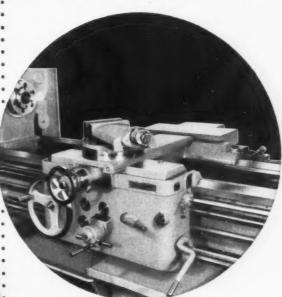
FROM SPEED TO SPEED IN 2 SECONDS OR LESS!

A flick of the control lever and you change to any speed through the hydraulically actuated shifter mechanism. The all-herringbone geared headstock provides 32 pre-selective spindle speeds (this was introducted FIRST by Sidney in 1947) in geometric progression all obtained by the rotating dial control. Think of the time and effort saved!

In addition, you get great strength and smooth operation in the headstock. The herringbone gears eliminate end thrust and provide longer life due to the opposed helix angle and greater tooth engagement.



32 PRE-SELECTIVE SPINDLE SPEEDS



SINGLE LEVER CONTROL CARRIAGE AND APRON

No complicated mechanism to worry about. Control for both standard longitudinal and crossfeed as well as 4-way rapid traverse is through a single lever which actuates positive serrated jaw plates. Safety overload feature is provided. Interlocking mechanism prevents use of the feed gearing when half nuts are engaged. Built-in thread chasing dial is mounted at angle convenient to operator's vision.

Write for new bulletins or for representative to call

THE SIDNEY MACHINE TOOL CO. . SIDNEY, OHIO

Builders of Precision Machinery since 1904



Staging unit for projection gaging developed by Automation Gages, Inc.

"Multi-Stage" for Projection Gaging

A universal staging unit has been developed by Automation Gages, Inc., Rochester, N. Y., to solve the parts-locating problem for a wide range of projection gaging applications. A large assortment of hardened and ground precision inserts and the main base of the staging unit are contained in a conveniently arranged chest.

The main base casting shown in the illustration has ground and finished surfaces to accommodate the various locating accessories. Special locking keys permit the use of this base unit as a shifting or traveling unit, making it practical to gage parts up to 4 inches long. For this application, "stop" components are inserted in comparator table slots at predetermined spaces so that the entire length of a part can be viewed progressively in conjunction with a superimposed chart layout. All parts are interchangeable and identified by numbers.

Circle Item 148 on postcard, page 255

Double-Acting Thrust Bearings for Forming Rolls

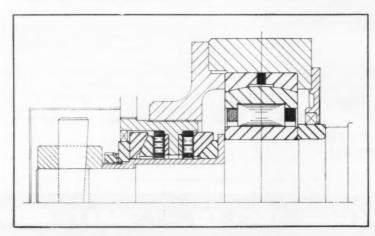
A double-acting aligning thrust bearing of the design shown in the accompanying cross-sectional view (center) has been developed by the Rollway Bearing Co., Syracuse, N. Y., for use under the most severe conditions where potential misalignment and heavy, intermittent thrust loads from either direction are present. In this assembly for steel-forming equipment, the special bearing consists of two center thrust plates, two roller assemblies, a left-hand convex-curved thrust plate with concave-curved aligning plate, a right-hand concave-curved thrust plate with convex-curved aligning plate, and an inner spacer sleeve.

Rollers 1 inch in diameter are staggered to insure even wear distribution. There are three 1/2-inch long rollers in each of ten slots and two 3/4-inch long rollers in ten alternating slots. The bearing thrust capacity at 100 R.P.M. is

114,275 pounds.

This Type DAT thrust bearing is used in conjunction with a specially designed Rollway aligning radial roller bearing. The outside of the double-flanged outer race is concave for alignment with the convex surface of the aligning ring. The capacity of the radial bearing is 278,800 pounds at 100 R.P.M. Bearing capacity, size, and design can be modified to suit customer's specifications.

Circle Item 149 on postcard, page 255



Cross-sectional view showing arrangement of double-acting thrust bearing developed by Rollway Bearing Co.

Wallace-Pedi Tube Notcher

A power-operated machine called the Wallace-Pedi notcher, which will double-notch both ends of a tube in only one operation per end in fifteen seconds, has been brought out by the Wallace Supplies Mfg. Co., Chicago, Ill. A tube such as used for a bicycle frame, for example, can be properly notched preparatory to welding to another tube at the desired angle. The operation consists simply of inserting the end of the



Tube-notching machine announced by Wallace Supplies Mfg. Co.

tube in the proper die and stepping on the control pedal.

The notcher can be equipped with as many as seven dies, depending on the size of the tubes to be notched. Thus, the notcher can be furnished with dies for notching tubes to be joined at right angles and at an angle of 45 degrees, for instance. The same machine can also be equipped to notch tubing of different sizes.

The machine is built in four different sizes. The smallest size has a capacity for cutting tubing up to 1-inch outside diameter and a wall thickness of 0.080 inch. Tubes up to 4 inches outside diameter and 0.220-inch wall thickness can be notched on the largest, or No. 4 machine.

Circle Item 150 on postcard, page 255 (This section continued on page 246)



Ideal for production line work! The CP-3440-RTS Reversible Air Impact Wrench gives you faster "run downs" to the *exact* tightness—then *automatically* cuts out. It completely eliminates "over torque". Torque control is simple to set on the job, requires no tools or jigs. Adjustment remains constant until change is desired. For detailed information write: *Chicago Pneumatic Tool Company*, 8 *East 44th Street*, New York 17, New York.

TORQUE SELECTOR permits full-speed run-down to desired tightness without limiting impact action or cutting production rates.

AIR RESTRICTION VALVE sets up secondary torque adjustment ranges for lighter work.

RANGE OF TORQUE ADJUSTMENT - 12 to 80 foot pounds.

SHORT OVER-ALL LENGTH—only 7½"—permits close-quarter work; weighs 6% pounds.

CAPACITY: 36" bolt size - heavy duty.



PNEUMATIC TOOLS . AIR COMPRESSORS . ELECTRIC TOOLS . DIESEL ENGINES . ROCK DRILLS . HYDRAULIC TOOLS . VACUUM PUMPS . AVIATION ACCESSORIES

MACHINERY, April, 1957—245



Thor Nutsetters

Right-angle nutsetter of line built in capacities up to 1/2-inch bolt size announced by Thor Power Tool Co., Aurora, Ill. Lightweight, simple in design, and with extra power, the tools are part of the manufacturer's No. 4 series of industrial air tools. These rotary airoperated nutsetters with direct drive are offered in six models and two types: No. 4RDC heavy-duty type in speeds of 350, 600, 1100, and 1300 R.P.M. and No. 4RDXC models in speeds of 800 and 1300 R.P.M. The latter models are equipped with right-angle attachments for use in close quarters.

Circle Item 151 on postcard, page 255

Quick-Action Step Valve

One of two new step valves, designed with large, direct air passages to give quick action, brought out by the Mead Specialties Co., Chicago, Ill. Because of the spool type plunger construction, the effort required to actuate these valves does not increase with increased air line pressure. To

maintain compact size and direct air passages, the air inlets and outlets are located close together, but the hose nipples are at an angle to accommodate quick connectors and large-diameter air hose. Valve bodies are accurately machined from aluminum; plungers are hard chromium-plated steel; caps, plugs, and hose nipples are brass; and all seals are non-corrosive. The valve plunger



reaches the wide open position before the end of stroke, saving wear and tear on seals and springs. For cam operation, the plastic knobs are replaced by hardened steel heads.

Circle Item 152 on postcard, page 255

Whitman & Barnes Oil-Hole Drills

One of a complete line of highspeed, oil-hole drills brought out by Whitman & Barnes, Plymouth, Mich. The drills in this line are designed for use on production runs in screw machines or turret lathes. They feature continuous holes drilled through the body and shank of the tool. This permits lubricant or air to pass freely to the drill point where it acts as a coolant and, also, as a force to eject chips and dirt. The continu-

ous oil-holes may be easily cleared and cleaned if blocked by foreign matter in the coolant. The oil-hole drills are regularly stocked in straight-shank taper length sizes ranging from 7/16 to 1 1/2 inches, in increments of 1/64 inch. Shank ends are tapped for use with threaded pipe connections or they can be made to suit special requirements. Taper-shank, extra length, and larger diameter oil-hole drills can also be furnished.

Circle Item 153 on postcard, page 255





"Strate-Face" Tap for Tapping Cast Iron

"Strate-Face" tap especially designed for tapping holes in castiron parts brought out by the Besly-Welles Corporation, South Beloit, Ill. A feature of this strong, free-cutting tap is a unique flute form which makes the tool remarkably effective in tapping castiron. The tap has a straight cutting face with a scientifically determined rake angle for freer cutting. It is available in standard ground thread sizes from No. 6 through the 3/4-inch size.

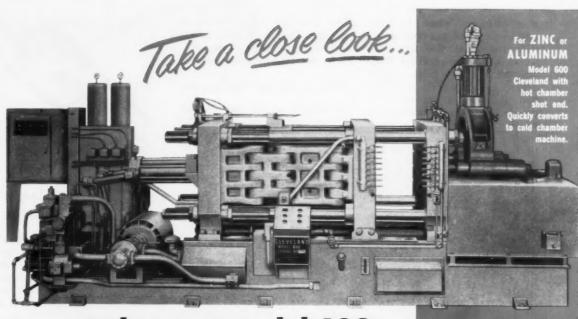
Circle Item 154 on postcard, page 255



Precision Clinometer

Lightweight Leitz precision clinometer introduced by Opto-Metric Tools, Inc., New York City. This clinometer has several novel features which are said to help widen the application of this type of instrument for checking the inclination of machine elements to a level plane or to each other. It can also be used for obtaining surface flatness during machining operations. The body is made of aluminum to reduce weight and the base is magnetized to make the instrument self-clamping in an inclined position. Leveling is

(Continued on page 248)



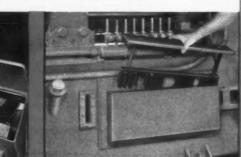
TLEVELAND

Cleveland's Model 600 brings to die casters a major advancement in die casting machine design. Its dozens of highly important features—many are exclusively Cleveland's — insure exceptional performance in delivering castings of precision quality at a fast production rate.

The "600" is massive—with guaranteed 600-tons locking pressure (strain gage tested). Maximum weight of

shot is 10 lbs. aluminum and 25.8 lbs. zinc. It has $46^{1}/_{2}$ " x 46" die plates; 28" x 28" space between the tie bars; 30" max. to 10" min. die thickness; 8" to 15" die opening.

Only a few "600" features are illustrated here, but these are typical of Cleveland's all-over quality construction. For full details, call in a Cleveland sales engineer and write for new Bulletin 600.



30 hp. totally enclosed motor drives two Vickers pumps which deliver 99.7 gal. per min. The 200 gal. hydraulic reservoir has filter capacity twice the pump capacity.

Magnet assemblies in hydraulic return line reservoir remove any metallic particles from the fluid. Adjustable bronze wedge supports for moving platen.



New hot chamber shot end, Improved cast steel shot cylinder and gooseneck supports permit quick gooseneck removal. High pressure swivel loints in hydraulic lines.

Automatic timing controps separate from machine, with push buttons convenient for operator's control . heavy, onepiece, machine length base extra rugged platens and toggles . dual accumulator system . . . manifold hydraulic . . . sufomatic lubrication . . many other important construction features.

REMEMBER, Clevelands Cut Costs!

4936 Beech Street Cincinnati 12, Ohio

SALES OFFICES: CHICAGO CLEVELAND • DETROIT HARTFORD • S. ORANGE

THE CLEVELAND AUTOMATIC MACHINE COMPANY

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

For more information fill in page number on Inquiry Card, on page 255

MACHINERY, April, 1957-247

possible in both planes by separate longitudinal and cross levels with individual fine-adjustment screw for the longitudinal level. The optical circle is graduated 120 degrees each side of the zero position and has a superimposed double vernier in the microscope, which corresponds with the direct reading in degrees, minutes, and thirty seconds. Accuracy of the optical circle and sensitivity of the level is stated as fifteen seconds of arc.

Circle Item 155 on postcard, page 255

Ace "Hi-Brinell" Drills

Ace "Hi-Brinell' drills for drilling hardened ferrous materials with a Rockwell hardness from C 40 to C 65, or even harder, are



now available from standard stock in sizes ranging from 1/16 to 3/4 inch from the Ace Drill Corporation, Adrian, Mich. Said to be ideal for many toolroom, die shop, and machine repair applications, these drills are produced in two different styles to cover the complete size range. Drills from 1/16 to and including 1/8 inch have a solid carbide insert brazed into a cylindrical tool steel shank. Sizes from 3/16 to and including 3/4 inch are equipped with a carbide tip brazed into a tool steel shank having a straight flute. Points of both types feature ample negative rake to eliminate thin projecting angles, increase drill ruggedness, and permit faster, easier penetration of the work.

The company will continue to produce "Hi-Brinell" drills in special sizes to meet requirements.

Circle Item 156 on postcard, page 255

"Check Master" Indicators

Six models of the new "Check Master" test indicators, including both regular and nonmagnetic types, announced by the Stand-



ard Gage Co., Inc., Poughkeepsie, N. Y. These indicators cover an exceptionally wide range of testing requirements. They respond to dimensional variations of 0.000020 inch; repeat without visible error; and can be used on all types of fixtures, surface plate setups, and for truing of pieces on machines. They are available with 11/8- or 13/4-inch dials, graduated in 0.0001, 0.005, or 0.001 inch, with a range of 0.008 or 0.016 inch. Also featured is an all-purpose "Check Master" model indicator that provides for both 0.0001- and 0.001-inch readings in a single instrument, simply by changing the contact point.

Circle Item 157 on postcard, page 255



Inserted-Blade End-Mill for Light Metal Alloys

Inserted carbide-tipped blade, straight-shank end-mill of selfgaging design that minimizes grinding time and permits quick diameter adjustments. This tool, standardized specifically for highperformance milling of aluminum and light metal alloys, is made in nine different sizes by Goddard & Goddard Co., Detroit, Mich. Diameters range from 1 inch to 2 1/2 inches; length of cut, 1 1/2 or 2 inches; shank lengths from 2 1/4 to 3 1/4 inches; and shank diameters from 1 inch to 2 inches that fit standard end-mill holders. Right-hand cut is standard. Blades, stocked for fast delivery, are held securely in the cutter bodies by replaceable serrated wedges. For quick adjustment, cutter diameters can be increased in increments of 1/32 inch by setting the blades one serration. No gages are required to check uniformity. Circle Item 158 on postcard, page 255

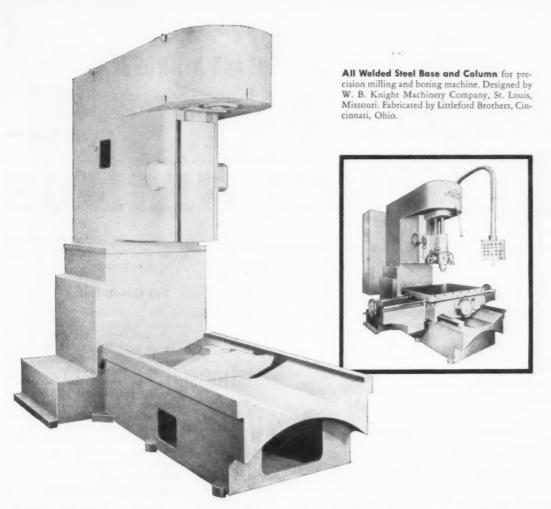
Ex-Cell-O Stainless Steel Actuator

An all-stainless-steel actuator, designed to operate within a temperature range from minus 67 to plus 600 degrees F., is being offered to the aircraft industry by the Ex-Cell-O Corporation, Detroit, Mich. This actuator is hydraulically operated over a range of pressures from 0 to 3000 pounds per square inch. It can also be

adapted to pneumatic operation to meet the requirements of certain installations. Prototypes, such as the actuator shown here, have a stroke of 7 inches. They are 16 inches long and 2 3/8 inches in diameter. However, these sizes can be altered to suit space and performance requirements.

Circle Item 159 on postcard, page 255





MORE RIGID TO HOLD CLOSER ALIGNMENT

... Welded steel design makes it possible at lower cost

BY proper use of welded steel construction, many types of machines can be built to hold closer alignment and maintain higher tolerances. This is possible because steel is 2½ times as rigid as iron.

Because steel designs use less material, and because steel costs only a third as much per pound as iron, costs can be lowered substantially.

On these precision machines, rigidity for close

alignment is combined with modern appearance. Additional savings in cost are possible since patterns and castings are eliminated.

Benefits like these could be duplicated in your designs. Lincoln's 45 years of cost-cutting experience can show you how.

Designers and engineers write for bulletins on designing for steel.

THE LINCOLN ELECTRIC COMPANY

Dept. 1219, Cleveland 17, Ohio

When steel is three times stronger than iron Has 2½ times the rigidity

Yet costs
% as
much

WHY

aren't all your products' designed for welded steel



By E. S. Salichs

BETWEEN GRINDS

Desk on Deck

A travel agent has worked out trips by boat to Bermuda this summer which will include expert instruction in fiction-, poetry-, and article-writing techniques while on board, there being both morning and afternoon workshop sessions. Want to sign up for our Draft-While-You-Drift cruise?

Where Stiff Bills Emerge?

Quoting from the description of a new \$20,000,000 resort hotel: "The front of the Diplomat will be gold anodized aluminum and glass. Curving gently away from the entrance will be the administration offices."

Thanks, Think

An IBM customer engineer received \$5000 for suggesting an improved bedplate, highest award ever paid by the International Business Machines Corporation for a single suggestion.

With Kid Gloves Though

Somewhere we read an interpretation of the popular phrase "Spearhead the issue"—You be the goat.

The Dawn, Darn

Saw a printed sign in a shop which read, "This is a nonprofit organization. It wasn't meant to be -but that's the way it worked out."

The Words that Get Around

Advertisers Digest recently reprinted a condensed article from Feedstuffs which incorporated a Machinery editorial in toto—"No Time to Read?"—written sometime ago by our Editor, Charles O. Herb. A friend sent in a copy. We not only re-read it, but took time out to read the joke on the next page. About the sour-faced boss who announced a sales contest to his assembled salesmen. An eager voice called out, "What does

the winner get?" "He gets," replied the boss, "to keep his job!" We then went back to ours.

Tall Tale in Tail

In a certain fishermen's club, there is a strange fish mounted on the wall, its tail resembling that of a jet B-32. An exhibit in a liars' contest, the specimen won the prize as the story-teller described how he caught this fish which would propel itself 100 feet into the air and then dive-bomb into the water. Finally he landed it, and had it mounted. He omitted to mention, however, that the taxidermist charged him \$50 extra to construct the jet-like tail.

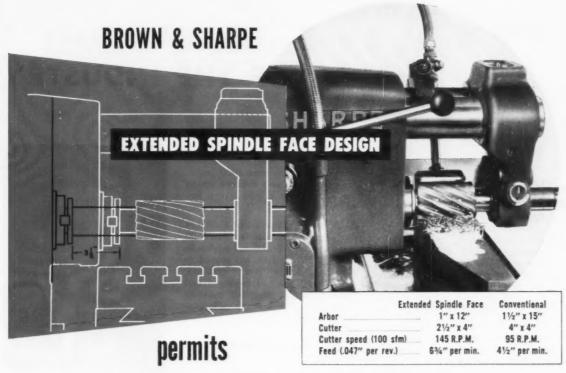
Steel-Hot and Sweet

"We can make such beautiful steel strip together," paraphrasing a once-popular ballad, was lightly suggested as a theme song for its company in *High Gradient* (house organ of Selas Corporation of America), by way of wooing the steel industry.



PEACEMAKER FOR THE PRESIDENT—On the occasion of his second inauguration, President Eisenhower received this handsomely engraved Colt Peacemaker—the revolver that brought peace to the West—from Leopold D. Silberstein, seen here smilingly examining the gift. Mr. Silberstein is president and chairman of the Penn-Texas Corporation, with which Colt's Patent Fire Arms Mfg. Co. and its parent organization, Pratt & Whitney Co., Inc., are affiliated. The gun, heavily inlaid with hammered gold, depicts symbols of the "Old West," including a Conestoga wagon, a buffalo, a cow puncher on his bucking bronco, and a great bald eagle. The revolver can be fired—but in terms of the 2500 hours of engraving and gold inlay work done by the Colt workers at Hartford, we'd substitute junior's

Daisy Super Smoke model for rifle practice.



30% SAVING

in cutting tool expense

A simple feature at first glance, the extended spindle face of Brown & Sharpe Universal and Plain Milling Machines is the source of multiple savings in milling costs. As the diagram shows, this exclusive design brings the spindle nose support over 3" closer to the cutting point, providing greatly increased rigidity and resistance to vibration.

PLUS - 50% FASTER PRODUCTION

In the set-up illustrated, the use of smaller diameter cutters permitted an increase in RPM at the given surface speed.

Feed rate was increased proportionately, providing 50% faster production with the same surface quality.

The extended spindle face is one of many examples of economy-minded design found only in Brown & Sharpe Milling Machines. Get full information . . . compare.

You'll find there is no better investment — by any test. Write:

Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.



MILLING, GRINDING, AND SCREW MACHINES, CUTTERS, MACHINE TOOL ACCESSORIES, PRECISION TOOLS, PUMPS

You save with . . .

SMALLER DIAMETER ARBORS

Because of shorter span between supports, a shorter, smaller diameter arbor can be used, with deflection resistance equal to that of 50% larger diameter arbor on conventional machine. REDUCES ARBOR COSTS

SMALLER DIAMETER CUTTERS

Because of reduced arbor diameter, in the example illustrated a $2\frac{1}{2}$ " x 4" cutter with 1" hole replaces the 4" x 4" cutter with $1\frac{1}{2}$ " hole required on a conventional machine.

REDUCES CUTTER INVESTMENT

EXTENDED CUTTER LIFE

Extra support and increased rigidity minimizes vibration. Cutters run longer before resharpening. Downtime is reduced.

SAVES MAINTENANCE COSTS



No. 2 UNIVERSAL Milling Machines 3 and 5 HP Spindle Drive

No. 2 PLAIN Milling Machines 3 and 5 HP Spindle Drive

News of the industry

California

J. L. Axelson Co., San Marino, Calif., has been appointed sales and engineering representative in Southern California for the Colonial Broach & Machine Co. Axelson will represent the complete line of machine tools, cutting tools, and components produced by Colonial and two of its domestic affiliates—Colonial Bushings and New Method Steel Stamps. The territory will comprise the southern ten counties of California, including the metropolitan areas of Los Angeles and San Diego.

CHARLES E. PRETZINGER has been appointed Pacific Coast district manager of Pangborn Corporation, Hagerstown, Md. From his headquarters in Pasadena, Calif., he will direct Pangborn's Pacific Coast field organization in the application of blast-cleaning and dust-control equipment. Mr. Pretzinger has served as district sales manager since 1948 and was previously associated with the Link-Belt Co.

WILLIAM R. JENNINGS, formerly factory manager of the Axelson Mfg. Co., Division of U. S. Industries, Inc., Los Angeles, Calif., has been



William R. Jennings, manager of Machine Tool Division, Axelson Mfg. Co., Division of U. S. Industries, Inc.

promoted to manager of the Machine Tool Division. He has been with the company since 1920, beginning his career as a machine operator, and has since held several key positions.

DITZEN ENGINEERING & SALES Co., representative in Northern California for Rivett air and hydraulic valves and cylinders, has moved to 6002 Telegraph Ave., Oakland, Calif. Floor space is increased and office personnel doubled, enabling the company to better handle customer needs.

Illinois, Kentucky and Missouri

WHEELCO INSTRUMENTS DIVISION, Barber-Colman Co., Rockford, Ill., announces the expansion of sales and service facilities in the Cleveland, Atlanta, Detroit, Los Angeles, Philadelphia, Pittsburgh, Rockford, and St. Louis areas. HAROLD DIRKERS is the new branch manager of the St. Louis office. HOWARD BERGER has been appointed manager of the Cleveland office. NORMAN H. FER-TIG has joined the service staff in Cleveland. STANLEY HANSON has become manager of the Detroit branch, and GEORGE HALL has been named sales engineer at Detroit. Louis D. Gercken has joined the Atlanta sales engineering staff. At the Los Angeles office, HYMAN HACKER and SHELTON CASHBAUGH have been named sales engineers and ROBERT B. SANQUIST, service engineer.

LINDBERG ENGINEERING Co., Chicago, Ill., announces the appointment of H. E. POLLARD to chief engineer of the Lindberg-Fisher Division, manufacturers of non-ferrous metal melting furnaces and aluminum pumping units.

H. B. Bradshaw has been appointed general manager of the De Laval Separator Co.'s Midwestern office located in Chicago, Ill. Mr. Bradshaw has been with the company since 1940.

WILLIAM J. LAUGHLIN has been appointed industrial division man-



William J. Laughlin, industrial division manager, Thor Power Tool Co.

ager—a newly created position—of Thor Power Tool Co., Chicago, Ill. Mr. Laughlin, Los Angeles manager since 1953, will supervise all Thor industrial air and high-frequency electric tool sales throughout the company's domestic and export branches.

American Broach & Machine Division, Sundstrand Machine Tool Co., has changed its address from Ann Arbor, Mich., to Rockford, Ill.

Air Reduction Sales Co., a division of Air Reduction Co., Inc., announces the following regional appointments: H. C. Wallace was appointed assistant regional sales manager of the Southern Region with headquarters in Louisville, Ky. A. C. Pease, assistant sales manager, succeeds Mr. Wallace as district manager.

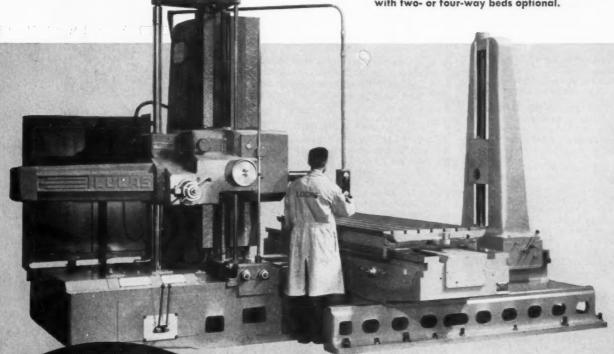
Joseph T. Ryerson & Son, Inc., warehousing subsidiary of Inland Steel Co., has entered into an agreement with the Jasper Blackburn Corporation, St. Louis, Mo., to lease the Blackburn property on N. First St., which will be used to expand the Ryerson operations in St. Louis.

(This section continued on page 260)

there's always work for a Lucas

Extreme accuracy, feather-touch pendant control, automatic power positioning for repetitive work make a Lucas the most useful machine in any shop. There's a model and size for *your* horizontal boring, drilling and milling operations. Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.

A complete range of models, built in 3", 4" and 5" spindle sizes with mechanical controls and in 4", 5" and 6" sizes with electrical controls. Wide variety of table and saddle sizes with two- or four-way beds optional.



LUCAS OF CLEVELAND

A DIVISION OF THE NEW BRITAIN MACHINE COMPANY

Other New Britain Machine Tool Divisions

New Britain-Gridley Machine Division
New Britain, Connecticut

Hoern & Dilts Division
Saginaw, Michigan

R B.W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY



Technical-ities

By John S. Davey

Factor of Safety make it a reality

You can't calculate that with a bolt having yield strength of 4 times the working load you're automatically getting a safety factor of 4. Far from it, Only when the bolt is tightened to four times working load do you get it.

That's because rigidly fastened members can be externally loaded to the full value of residual tension in bolts without any separation or extra bolt stress.

Suppose you need a bolt for a 5000 lb. working load. For a X4 safety factor, you use a bolt of 20,000 lb. capacity, and tighten it to 20,000 lb. tension. If you tighten to only 10,000 lbs., any external load larger than this causes loosening, and progressive bolt failure from fatigue. So your safety factor is really only 2.

PRODUCTION MAN FOLLOW-THROUGH IMPORTANT

Factor of safety, then, is not established on the drawing board. It can only be put into the product by the shop man with wrench. In short, a bolt is no better than the supervision of its tightening.

A NOTE ON FLEXIBLE JOINTS

This case is different. You tighten such a joint just to working load. So use a bolt capable of this plus any added stress multiplied by your safety factor.

How to simplify bolt and nut usage

Despite their now unified dimensions, "standard" fasteners number thousands upon thousands of different types and sizes. More and more companies are beginning to realize that usage simplification offers advantages.

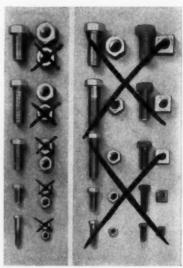
EXAMPLES

A well known electrical manufacturing company finds it no handicap to eliminate all 1/16" bolt sizes above 36", thereby simplifying production and purchasing.

One engineering firm eliminated 1700 different fastener items from inventory by determining that the jobs could be done as well by other sizes or types.

SOME SUGGESTIONS

To guide your thinking, RB&W points up the following ways to simplify: (1) Forget thread fits for all but specialized needs - standard "tolerance fits" have thoroughly proved themselves. (2) Why adhere to double thread standard when coarse threads prove stronger and assemble faster? (3) Stick with hex head bolts - they do better jobs than square. (4) It can save money to change diameter or length, rather than to add another item to stock. (5) Two standard physical grades meet most load range requirements - do you really need special alloys? (6) Heavy nuts really belong with larger size bolts - use finished nuts with the smaller sizes.



Here is a graphic display of possible simplification. From a typical array of fasteners, it shows what may be superfluous for meeting the requirements of proper fastening in a great many instances.

RB&W would be happy to enlarge on these facts, and help you simplify fastener selection to get proper joint strength and cut assembly time and inventory. Write Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N.Y.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

High strength bolts save costly crane

At one company's plant, a large, heavy-duty crane had deteriorated due to rivets loosening. Replacing with new rivets was no permanent answer, but RB&W high tensile bolts were. Used with hardened washers, these RB&W bolts clamp mem-

Used with hardened washers, these RB&W bolts clamp members together so tightly, no slipping into bearing takes place, holes are reinforced against fatigue, and connections become vibration-proof.

Assembling heavy duty equipment with RB&W high strength bolts in the first place can avoid such problems and create more satisfaction with the product.



PRODUCT INFORMATION SERVICE

Use postage-free Business Reply Cards for further information
On New Catalogues described in this issue of MACHINERY
On New Shop Equipment described in the editorial pages
On products shown in the advertisements

NEW CATALOGUES

COLD-ROLLED SPRING STEELS—Wallace Barnes Steel Division, Associated Spring Corporation, Bristol, Conn. 48-page catalogue entitled "Fact Book of Cold-Rolled Spring Steels," presenting a brief course of instruction on the subject of spring steel: Its essential qualities, the various grades and what each is most commonly used for, and how it is rolled, annealed, slit and filed, hardened and tempered, polished, colored, and inspected at the company's facilities. Copies of this booklet may be obtained free on request from J. S. Gamble, Wallace Barnes Steel Division, Bristol, Conn.

TOOLING SERVICES—National Tool & Die Manufacturers Association, Cleveland, Ohio, 68-page pocket-size directory listing approximately 1000 contract tool and die plants throughout the United States and Canada. Information given includes company names, addresses, and telephone numbers; names of individuals to contact; and the specific products and services offered by each association member. Copies of this directory can be obtained by writing to George S. Eaton, National Tool & Die Manufacturers Association, 908 Public Square Bldg., Cleveland 13, Ohio.

LATHES—Monarch Machine Tool Co., Sidney, Ohio. Illustrated catalogue No. 1603, describing the company's Series 80, heavy-duty Dyna-Shift lathes, Models 1600, 1601, 2000, 2001, and 2002. Equipped with the company's Dyna-Shift drive headstock, these Series 80 lathes offer automatic calculation and setup of spindle speeds, plus instantaneous hydraulic shifting. Copies of this catalogue are available upon business letterhead request from the Monarch Machine Tool Co., Sidney, Ohio.

HEATERS—General Electric Ca., Schenectady, N. Y. 72-page catalogue listing and describing the company's electric heaters and heating devices. Information is given on such products as redesigned cartridge heaters, miniature soldering irons, aluminized steel sheath strip heaters, and new ratings and configurations of finned tubular heaters. Also described are the new ceramic-to-metal and plastic resin hermetic seals. Data, specifications, operating Information,

and manufacturer's recommended list prices on standard G-E electric heaters and heating devices are included. . . . 1

BRUSHES—Osborn Mfg. Co., Cleveland, Ohio, Two-color folder describing the company's "Rota-Master" brushes of open-face construction and made in 16-, 18-, and 24-inch face widths. Several units can be mounted on the same shaft to provide brushes of various widths. One of their principal uses is for the cleaning of rubber or fabric conveyor belts. Other operations for which they are suited are material spreading, dust removal, and metal finishing when used with abrasive compounds. The folder covers specifications, horsepower, and machinery requirements; and a drawing illustrating method of setup is included.

BRAZING OF STAINLESS STEEL—Stainless Processing Division, Wall Colmonoy Corporation, Detroit, Mich. Catalogue SD-24 entitled "Experimental and Production Brazing and Processing of Stainless Steel," describing and illustrating the special facilities and skills available to users of parts fabricated of stainless steel, titanium, and special allays. Included in this catalogue are photos showing a cross-section sampling of the equipment and machinery in use at the company's facilities. Other photographs show typical parts that have been fabricated for aircraft, automotive, and other industries.

WORK POSITIONERS — American Machine & Foundry Co., New York City. Illustrated catalogue describing the company's Lowerator self-leveling work positioners for material positioning and handling. Illustrations of different types and models show how the top layer of material on the platform of the Lowerator work positioner is always kept at working and dispensing level whether unit is full, half-full, or nearly empty. Installation photographs show the adaptability of these positioners. Specifications of all types and models, including dimensions and capacities, are given. . 4

TEMPERATURE INDICATORS—Leeds & Northrup Co., Philadelphia, Pa. Folder giving concise information about the company's electronic Speedomax G potentiometer instruments, which indicate thermocouple temperatures at the flick of a switch on a drum type scale 25 1/2 inches long. Features, specifications, and ranges for a standard-case instrument with door-mounted switches, a small-case instrument with door-mounted switches, and a console instrument for desk-top mounting for as many as 200 thermocouple points are listed. 5

AIR CONTROL VALVES—Ross Operating Valve Co., Detroit, Mich. 71-page data file giving information on the company's Starline series of air control valves—a group of five pilot heads which are interchangeable with seven valve bodies. This line of valves provides longer life, compactness in design, and lightweight

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valves for control of industrial air power. Dimensional data, a list of parts, price list, and flow diagrams are included.

MACHINE TOOLS AND ACCESSORIES— Cincinnati Milling Machine Co., Cincinnati, Ohio. General catalogue No. M-1961, covering the company's various lines of products. The catalogue is divided into ten sections: milling machines; broaching machines; cutter and tool grinding machines; grinding machines; grinding wheels; cutting fluid; selective hardening machines; metal forming machines; special machine tools; and where to buy.

METERS, VALVES, AND REGULATORS—Rockwell Mfg. Co., Pittsburgh, Pa. 28-page catalogue No. C-5000, covering the company's meters, valves, and regulators. The catalogue also includes completely revised Nordstrom valve specifications and is completely restyled, with emphasis on the use of photo illustrations of all major products described. 9

TURRET PUNCH PRESSES—Wiedemann Machine Co., Philadelphia, Pa. Bulletin 500DM, describing the company's heavy-duty punch preses equipped with direct-measuring gage and table. Specifications and detailed information on features and operating principles of these 40- to 150-ton capacity machines are included. These presses provide a flexible method of locating and piercing holes of many sizes in large metal sheets and plates in one handling.

BROACHING MACHINES — Detroit Broach & Machine Co., Rochester, Mich. 8-page brochure describing the company's vertical twin-ram broaching machines which incorporate many exclusive features providing for greater production, finer accuracy, and better finish. These machines are available in capacities ranging from 5 to 25 tons, stroke lengths from 30 to 100 inches, and cutting speeds between 4 and 35 feet per minute.

DRILL PRESSES—Delta Power Tool Division, Rockwell Mfg. Co., Pittsburgh, Pa. 12-page Illustrated builetin describing the complete line of Rockwell-Delta drill presses. Specifications are given for floor and bench, single- and multiple-spindle models in several basic sizes. The catalogue also describes how Delta drill presses have been used to supplement or replace heavier, more expensive machines in production aperations in several plants. 12

SYNCHRONOUS-PRECISION CONTROL—General Electric Co., Specialty Control Department, Waynesboro, Va. Bulletin GEA-5945A, discussing all facets of the company's synchronous-precision control for resistance welding. Typical areas of application are listed, and use of this

FASTENERS — Accurate Threaded Fasteners, Inc., Chicago, III. Brochure describing the company's complete line of fasteners available in stainless steel and aluminum—thread cutting screws, sheet metal screws, machine screws, capscrews, washers, and others. These fasteners are also available in brass, steel, silicon, phosphor bronze, and many other

STUB TAPS—Pratt & Whitney Co., Inc., West Hartford, Conn. Leaflet describing the company's stub taps de-

Product Information Service

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AIR SANDERS—Magnetic-Pneumatic Division, Sundstrand Machine Tool Co., Rockford, Ill. Bulletin 800-1, describing the company's orbital sander Model 800 that weighs only 3 pounds yet has the power and capacity to perform tough production sanding jobs. Included in the bulletin are illustrations of several typical jobs on which the new unit is being used.

BAND SAWS—Henry Disston Division, H. K. Porter Co., Inc., Philadelphia, Pa. Folder describing the company's line of metal saw blades. Information is given on saw problems concerning ferrous and non-ferrous metals, plastics, wood, and pulp material. A complete list of the latest machine specifications is given. 23

CUTTING TOOLS—Fastcut Tool Co., Detroit, Mich. 36-page catalogue giving complete descriptions, specifications, and list prices of the company's line of Fastcut tools which includes N-mills, Woodruff keyseat cutters, center reamers, and combined drills and countersinks. . . . 24

TWO-WAY LOCK-NUT—MacLean-Fogg Lock Nut Co., Chicago, III. 12-page catalogue containing American Standard dimension tables on all M-F lock-nuts and semifinished nuts, as well as engineering data on wrench torques and test procedures for prevailing torque type lock-nuts.

POWER QUILLS—Precise Products Corporation, Racine, Wis. Catalogue describing the company's power tools. A special section is devoted to "Power Quills," featuring the company's Precise Super 80, a versatile 1 1/2-H.P. tool with variable speeds from 7,000 to 25,000 R.P.M. 26

HORIZONTAL REDRAW PRESSES — Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. Catalogue 926-M-4, describing the company's complete line of horizontal, multi-station, automatic redraw presses for quantity production of straight and shouldered, deep shells in a wide variety of sizes and

MILLING MACHINES — Van Norman Machine Co., Springfield, Mass. Catalogue describing the company's new line of ram type milling machines. These millers have an adjustable cutter-head-permitting horizontal, vertical, and angular milling without attachments—as standard equipment.

INDICATOR GAGE—Elistrom, Inc., Dearborn, Mich. Illustrated folder listing specifications, suggested applications, and prices for the company's Shalo-Chek adSOCKETS—Apex Machine & Tool Co., Dayton, Ohio. Catalogue 129, describing and listing the company's entire line of fast lead and surface drive sockets. The fast lead sockets are designed for high-speed nut-running, particularly on applications involving multiple-unit tools.

WELDING CHART—Hobart Bros. Co., Troy, Ohlo. Wall Chart EW-198, listing and giving instructions on the use of electrodes, including carbon and lowPRESS BRAKES—Dreis & Krump Mfg. Co., Chicago, Ill. Bulletin 57PR, describing the company's Series D, heavy-duty, steel press brakes, All the principal features are described, and specifications and capacities of the forty standard sizes are included.

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FASTENERS—Chicago Screw Co., Bellwood, Ill. Illustrated brochure describing the company's line of standard fasteners. Information is also given on "Carbon Restoration"—a process that is said to eliminate fastener failures in heattreated items.

TURRET TOOLPOSTS—McCrosky Tool Corporation, Meadville, Pa. Bulletin No. 19-T, illustrating and describing the company's turret toolposts featuring a clamping type handle that assures positive locking and withstands vibration. 38

Liquid-GAS SEPARATOR—Selo. Corporation of America, Dresher, Pa. Bulletin S-1052, describing the company's Liqui-Jector, a liquid-gas separation device for removal of entrained liquids and solids from air, gas, and steam systems.

COPYING LATHE — Cone Automatic Machine Co., Inc., Pilot Division, New York City. Folder describing the company's Conomatic Pilot automatic multicycling copying lathe. Design details of the lathe, which is hydraulically controlled, are given.

INDICATING PNEUMATIC CONTROL-LERS—Minneapolis-Honeywell Regulator Co., Industrial Division, Philadelphia, Pa. Catalogue describing the company's Brown small-case indicating pneumatic controllers for temperatures and pre-

AUTOMATIC WELDERS AND POSI-TIONERS—Sight Feed Generator Co., West Alexandria, Ohio. Illustrated bulletin entitled "Rexarc Keeps Earth-Moving Equipment Rolling," describing the company's Rexarc welders, positioners, and components.

SPEED REDUCERS—American Pulley Co., Philodelphia, Pa. Catalogue SCD-57, describing the company's line of shaft-mounted Screw-King speed reducers expecially designed for screw conveyor application.

MARKING DEVICES—Jas. H. Matthews & Co., Inc., Pittsburgh, Pa. Group of leaflets covering the company's production marking and embossing machines. Units described and illustrated are designed for high-speed production. . . . 46

DIAMOND DRESSING TOOLS—Craine-Schwartz Diamond Tool Co., Detroit, Mich. Folder containing illustrations and complete descriptions of the more conventional types of diamond dressing tools.

FLAT TYPE MOTORS—Diehl Mfg. Co., Somerville, N. J. Illustrated bulletin No. 3461, describing several models of flat type motors for the machine tool and original equipment manufacturing in-

GRINDING WHEELS—Simonds Abrasive Co., Philadelphia, Pa. Folder ESA-272, describing the company's SA Borolon grinding wheels which are produced in single crystal form without crushing. .53

HEAT EXCHANGERS—Davis Engineering Corporation, Elizabeth, N. J. Bulletin 140, describing the company's Paracoll oil and water coolers Type "P" exchangers.

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NEW! Electrospark Machine FOR TOUGH METALS

Sintered carbides and super alloys—in growing demand these days—are costly to machine, and even more costly to scrap. But you can now machine metals of extreme hardness and toughness easily and economically.

With an Ex-Cell-O Method X Machine, cemented carbides, hardened steels, cast alloys and titanium alloys can be cut off, pierced, slotted, formed, trepanned, drilled and tapped, often in shapes no other machining method can match.

Check on the very real savings Method X may offer to your operations . . . contact Ex-Cell-O in Detroit.



MANUFACTURERS OF PRECISION MACHINE TOOLS . GRINDING AND BORING SPINDLES CUTTING TOOLS . RAILROAD PINS AND BUSHINGS . DRILL JIG BUSHINGS AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS . DAIRY EQUIPMENT





(Left to right) Charles R. Staub, retiring chief engineer, and J. C. Drader, vice-president of research, Michigan Tool Co.

Michigan and Wisconsin

MICHIGAN TOOL Co., Detroit, Mich., announces that CHARLES R. STAUB, former chief engineer, has retired. Mr. Staub has been serving as staff consultant to the company for the past two years. He joined the company in 1929 and, progressing through various supervisory functions, was named chief engineer in the early thirties-a post he held for many years. At the same time, it was announced that J. C. DRADER, at present a vice-president, has been named vice-president of research, a post created by the company's expanding work in the gear development field.

VICKERS INCORPORATED, Detroit, Mich., announces the appointment of J. F. Forster as executive vice-president. He will have direct charge

of all company operations. Mr. Forster joined the company as treasurer in 1941 and was made vice-president and assistant general manager in 1949. At the same time, it was announced that four additional operating divisions have been formed. The new Machinery Hydraulics Division will have M. A. HAYDEN as general manager and W. F. DRIVER as general sales manager. This division will take complete responsibility for all hydraulic components and systems for metal-cutting, forming, and welding equipment; and plastic molding and die-casting machines.

GENERAL ELECTRIC METALLURGI-CAL PRODUCTS DEPARTMENT, Detroit, Mich., announces formation of an applied mechanics engineering group headed by H. J. Siekmann as manager. This new unit will be responsible for obtaining basic information on physical properties, machinability, fundamental application requirements; and for performing stress analyses to guide material development. It will also help establish design and application criteria.

GEORGE F. BURRAS has joined the sales engineering staff of W. O. Barnes Co., Inc., Detroit, Mich. His headquarters will be in Kansas City, Mo., to distribute the company's product in the Midwest.

PENINSULAR MACHINERY Co., Detroit, Mich., has been appointed by the Birdsboro Steel Foundry & Machine Co. to sell Birdsboro hydraulic presses and related equipment in the state of Michigan.

ROBERT J. DUBUC has been appointed manufacturing manager of the Gear Grinding Machine Co., Detroit, Mich.

Warner Electric Brake & Clutch Co., Beloit, Wis., announces two executive appointments: Norman K. Anderson was named vice-president and general manager of the Warner Industrial Division, and King DeSeve was named vice-president and general manager of the Warner Automotive Division. Mr. Anderson, who formerly held the post of vice-president of sales, joined the company in 1946. Mr. DeSeve, formerly vice-president in charge of manufacturing operations, joined the company in 1951.

THEODORE OSBORNE has been appointed manager of the Far East and South American sales for the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

(This section continued on page 263)







(Left to right) J. F. Forster, executive vice-president, Vickers Incorporated; M. A. Hayden, general manager, and W. F. Driver, general sales manager of Vickers Machinery Hydraulics Division

Father and Son Teams

...a tradition at <u>Illinois</u> Gear

Throughout the modern plants of Illinois Gear are many father and son teams

They typify the fine family spirit which is also engendered by the many other like the one pictured below.

Fathers, who learned their skills at Illinois Gear, are proud to pass them relatives working side by side at Illinois Gear. along to sons who, from early youth, have been steeped in traditions of quality.

Naturally, we are very proud of these many father and son teams. They, and hundreds of other skilled craftsmen of the Illinois Gear team, are responsible for

For gears that are made right with quality as the first consideration—depend the manufacture of the finest gears in America.

The intent interest of the younger on ILLINOIS GEAR. man in the precision techniques of his father reflects the deeprooted desire for quality craftsmanship that characterizes every step in the manufacture of Illinois Gears. Look for this mark (LL) the symbol on finer gears

ILLINOIS

Gears for Every Purpose ... one gear or 10,000 or more

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smooth power

. . . CONE-DRIVE gearing has no equal.

You can drive the most delicate equipment or the heaviest industrial machinery without vibration or noise through a set of Cone-Drive gears.

Smooth delivery of power is an outstanding feature of Cone-Drive double-enveloping worm gearing. It's the result of a unique design that puts one-eighth of all gear teeth in simultaneous, full-depth contact with the worm threads.

The contact between teeth is "area" rather than
the line or point type contact found in
cylindrical worm gearing. This distributes the load
over more area on each tooth to
boost load-carrying capacity.

Want smooth, chatter-free, efficient power in a compact package? Cone-Drive gears will give it to you in gearsets or speed reducers in a wide range of models and sizes.

Ask for Bulletin 600-C for details.



DOUBLE ENVELOPING GEAR SETS & SPEED REDUCERS

New England

L. S. STARRETT Co., Athol, Mass., announces the retirement of J. E. HINDES-sales representative in the Pittsburgh, Pa., area-after fifty years of service with the company. W. E. CLARK, JR., previously covering western New York, succeeds Mr. Hindes in the Pittsburgh area. J. R. BOEHM, formerly of the Los Angeles area, has been appointed sales representative in western New England, succeeding C. A. BASSETT, recently appointed general sales manager. R. S. LOUGEE has also been made sales representative in western New England, assisting Mr. Boehm.

JACK MERRITT has been appointed direct sales representative for Hy-Pro Tool Co., New Bedford, Mass. Mr. Merritt will operate out of the Detroit office, located at 10428 W. Mc-Nichols Road. He will cover the state of Michigan.

WILLIAM H. PERKS has been elected treasurer of the Norton Co., Worcester, Mass.

HARTFORD SPECIAL MACHINERY Co., Hartford, Conn., announces the appointment of George O. Desautels, 2302 N. Meridian St., Indianapolis, Ind., as representative. As the Illinois representative, ZIMMERMAN & GAUMOND, INC., Pickwick Bldg., 3 S. Prospect, Park Ridge, Ill., has been named.

ERNEST S. GRISWOLD has been appointed chief product engineer of the Cutting Tool Division of Pratt & Whitney Co., Inc., Hartford, Conn. Mr. Griswold succeeds John S. Gibson, who has become chief engineer of the Illinois Tool Works, Chicago, Ill.

BULLARD Co., Bridgeport, Conn., announces the following appointments: CLIFFORD H. HAGBERG has been named assistant sales manager and EDWARD A. SUNDSTROM, district manager of the Chicago sales office.

New York and New Jersey

EDWARD GERSTENSCHLAGER has been appointed manager of production engineering of the Babcock & Wilcox Co.'s Boiler Division, New York City.

CHARLES F. RADLEY, one of the original directors of Oakite Products, Inc., New York City, has retired from active duty. He was a director



Charles F. Radley, retiring director of Oakite Products, Inc.

of publicity and a member of the company's board of directors. He is, however, continuing in the employ of the company as a consultant.

U. S. HOFFMAN MACHINERY CORPORATION, New York City, announces the appointment of Revis L. Stephenson as executive vice-president. In addition to his new responsibilities, Mr. Stephenson will retain his directorship of the company's foreign and export operations and supervision of the Industrial Divisions.

George E. Hawkins, vice-president of Air Reduction Co., Inc., New York City, was elected executive vice-president of the company. Mr. Hawkins joined the company in 1917. He has been a vice-president since 1941 and a director since 1949.



George E. Hawkins, executive vicepresident, Air Reduction Co., Inc.

A. MILNE & Co., INC. announces the opening of new general office headquarters at 67 W. 44th St., New York City.

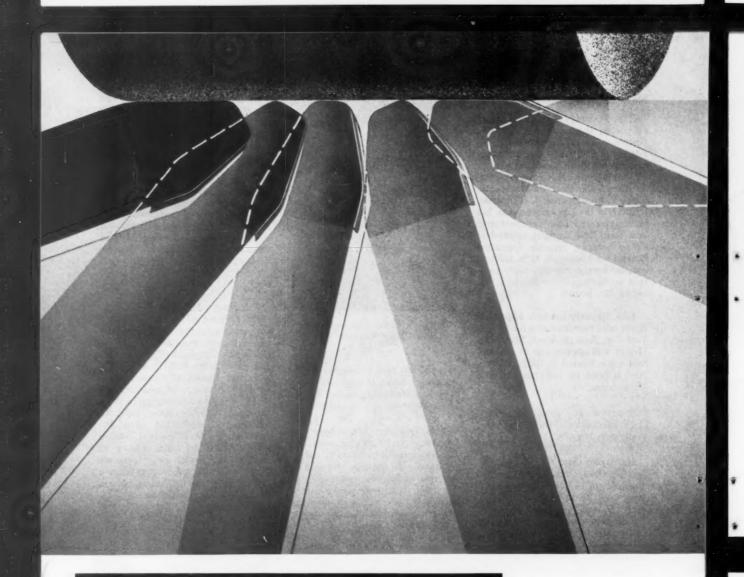
Kurt Orban Co., Inc., Jersey City, N. J., announces the formation of a Wire Machinery Division to handle sales of Herborn wire-drawing machines and auxiliary equipment, and Wafios wire-forming and weaving machines. The new division will be under the joint supervision of Robert H. Geiss and H. Eucene Fielder.

Ohio

CLEARING MACHINE CORPORA-TION, Division of U.S. Industries, Inc., announces that new and larger quarters have been selected for the company's Cleveland office. The new address is Room 956, Hanna Bldg., 14th and Euclid, Cleveland, Ohio. N. L. MAHALA, who was recently named district sales manager, will be in charge. At the same time, the following appointments were announced: F. W. Dorenbos became assistant chief engineer. ROBERT H. BARLOW has joined the corporation and is presently in Europe where he is working through Clearing branch offices in Paris and London as technical consultant in foreign operations. George Herrick has been appointed sales manager for the Detroit, Mich., area. JOHN МІСНЕLОТТІ has been named director of purchases.

BALDWIN-LIMA-HAMILTON Corporation, Hamilton Division, Hamilton, Ohio, announces the following appointments: Clarence A. Cheney has been appointed office manager and inside sales representative and CARL R. VIARS has been appointed press salesman. At the same time, the following dealer appointments were made: W. E. SHIPLEY MACH-INERY Co., Philadelphia, Pa., has been appointed a dealer for the State of Maryland for presses manufactured by the Hamilton Division. LYND-FARQUHAR Co., Boston, Mass., has been named New England dealer for Hamilton presses. Moehlen-PAH ENGINEERING, INC., St. Louis, Mo., has been appointed a dealer in six midwest states also for Hamilton presses.

ADAMAS CARBIDE CORPORATION, Kenilworth, N. J., has announced the appointment of OLIVER-INGALLS, 1857 E. 17th St., Cleveland, Ohio, as distributor in the Cleveland area. (This section continued on page 266)



OLIVER TEMPLATE TOOL BIT GRINDER

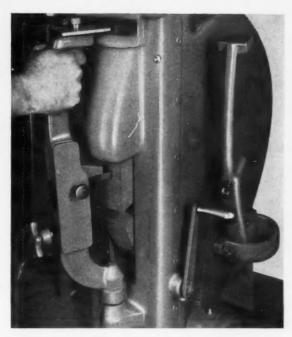
Precision Duplication

in **ONE** operation

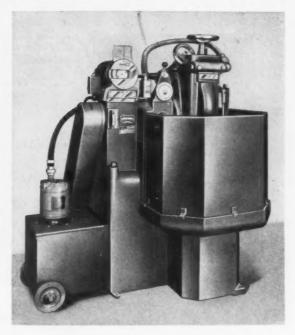
That's right! The Oliver Template Tool Bit Grinder sharpens single point tungsten carbide, high speed and stellite turning tools . . . duplicating exactly all original flats and radii every time the tool is ground . . . in one simple, efficient grinding operation.

How is it done? Well, as you can see from the drawing above the answer lies in "template control." The template at the top of the specially designed

tool holder is a twice size replica of the tool being ground. The tool, securely held at mid-point in the holder, contacts the wheel and is ground until the template fouches the template stop. In this manner, the tool is ground to the *exact* profile of the template. The entire operation is performed in seconds, easily, accurately on one machine . . . a machine that pays for itself by reducing your tool inventory and eliminating lost production time and tool breakage.



The Oliver Template Tool Bit Grinder has a 20" wheel that grinds turning tools up to $1\frac{1}{2}$ " wide by $1\frac{3}{4}$ " high, from 0° to 20° clearance . . . and to any predetermined contour or angle. The unit is self-contained in that it performs the complete grinding operation as well as template production. All working surfaces are hardened and ground steel and surfaced with tungsten-carbide where necessary to assure long life. A unique feature of the unit is the tool holder which permits an even, easily controlled tool pressure against the wheel. It's an iron frame-supported at its lower end by a ball and socket joint with a template at the upper end giving the operator a 2 to 1 leverage.



Outstanding among the Oliver Tool Bit Grinders' many advantages is ease of operation. Positive "template control" assures duplication of the tool shape in relation to the shank making all tools of a kind exactly alike. A clearance setting gauge determines the correct amount of metal to be removed. A plentiful supply of water, both through the wheel and on the tool, insures against overheating. The Oliver 20' Template Grinder will remove metal . . . both high speed and tungstencarbide . . . at a speed unmatched by any other single point tool bit grinder currently on the market.

More OLIVER of ADRIAN Tool Grinding Equipment



ACE TOOL and **CUTTER GRINDER**

Universal-grinds milling cutters, other cutting tools. Especially suited to grinding tungsten carbide.



DIE MAKING MACHINE

Produces dies, gages, cams, templates, stripplates, etc. at greatly reduced costs.
5 designs in 2 types.



FACE MILL GRINDER

Completely automatic. A machine tool designed accurate grinding. Wheel dressed with every stroke.



No. 510 DRILL POINTER

Semi-automatic. For drills 14" to 3" in dia-meter. No. 21 bench models available for size ½" and smaller.



DRILL POINT THINNER

For low cost reclaiming of drills. Corrects off-center and too-thick webs and outof-index cutting edges.

Just check the coupon for literature on the OLIVER of ADRIAN machine you are interested in. Send it today to ...



OLIVER of ADRIAN OLIVER INSTRUMENT COMPANY

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- 11	Drill	Point	ter	
ч	Face	Mill	G	
200	II A an	11 I In		

- rinder and Cutter Grinder
 - "Ace" Universal Tool
- Die Making Machine ☐ Drill Point Thinner
- Template Tool Bit Grinder

NAME

COMPANY

STREET

STATE

ZONE



Dan R. Scott, sales manager of the Allied Products Division of Motch & Merryweather Machinery Co.

DAN R. SCOTT has been named sales manager for the Allied Products Division of Motch & Merryweather Machinery Co., Cleveland, Ohio. Mr. Scott formerly held the positions of district sales manager for the company's Cutting Tool Division and assistant sales manager for the Allied Products Division.

TIMKEN ROLLER BEARING Co., Canton, Ohio, has announced the planned erection of a modern, two-story, steel-frame building—containing about 10,000 square feet on each floor—across from its main office.

HARRY M. COOK has been named manager of industry sales of the Clark Controller Co., Cleveland, Ohio. He replaces W. R. HECKMAN, who has been named assistant manager of operations.

CARPENTER STEEL Co., Reading, Pa., has opened a milling branch warehouse in Toledo, Ohio, to stock and service a wide range of tool steels and drill rods.

George A. Viscomi has been appointed sales manager of the Lees-Bradner Co.'s manufacturing division, Cleveland, Ohio. Mr. Viscomi has been with the company for four-teen years.

DAVID M. GASKILL has been appointed manager of industrial equipment sales for Brush Electronics Co., a division of Clevite Corporation, Cleveland, Ohio.

JACK T. CONNER has been appointed abrasive engineer for the

Sterling Grinding Wheel Co., Tiffin, Ohio. He will service the Youngstown, Ohio, area.

K. E. Kiess has been appointed works manager of Gar Wood Industries, Inc., Findlay Division, Findlay, Ohio.

Pennsylvania and Maryland

The R-P&C VALVE DIVISION, American Chain & Cable Co., Inc., Reading, Pa., announces several changes in the sales executive staff: JOHN W. SWANAGON, formerly district manager of the Atlanta, Ga., district, has been transferred to Philadelphia as district manager. George LEGAN, who for the past four years was a territory sales manager in the Alabama, Tennessee, and Mississippi area, replaces Mr. Swanagon and will make his headquarters at 1055 W. Marietta St., N. W., Atlanta. ROBERT FREEDLEY, sales manager for the Philadelphia district, has been promoted to district manager of the Pittsburgh, Pa., district, succeeding W. G. Whippo, who resigned.

Dr. Stewart G. Fletcher has been appointed vice-president—metallurgy of the Latrobe Steel Co., Latrobe, Pa. He will be responsible for all metallurgical activities concerned with the products manufactured by the company. He has been connected with research and development work on tool steels and allied materials for over fifteen years. In 1945, Dr. Fletcher became associated with the company as chief research metallurgist. In 1947, he was appointed chief metallurgist, and in 1956, he became director of metallurgy.



Dr. Stewart G. Fletcher, vice-president—metallurgy, Latrobe Steel Co.

STANDARD PRESSED STEEL CO., Jenkintown, Pa., announces the retirement of J. Whiting Friel, vicepresident, after more than forty years with the company. Ralph C. Gibbs has been named assistant purchasing agent. It was also announced that the company is planning to build a \$1,400,000 addition to the plant facilities of its Hallowell Steel Shop Equipment Division and, at the same time, expects to construct a \$5,000,000 plant in Santa Ana, Calif.

RICHARD G. FREDERICK has been appointed manager of the Crucible Steel Company of America's Baltimore, Md., sales branch. He has been with the company since 1935.

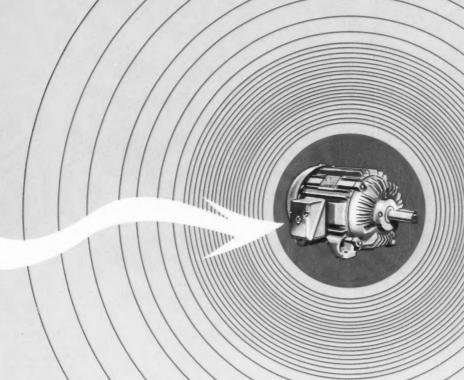
Coming Events

APRIL 9-11—Fifth Welding Show and Industrial Exposition sponsored by the AMERICAN WELDING SOCIETY to be held at Convention Hall, Philadelphia, Pa. Advance registration tickets and hotel information may be obtained from Robert T. Kenworthy, exposition management, 12 E. 41st St., New York 17, N. Y.

MAY 1-3-ELECTRONIC COMPONENTS SYMPOSIUM co-sponsored by four leading electronic organizations, to be held at the Morrison Hotel, Chicago, Ill. This meeting also has the active participation of agencies of the Department of Defense and the National Bureau of Standards. Information can be obtained from J. S. Powers, Electronic Components Symposium, 84 E. Randolph St., Chicago 1, Ill.

MAY 16-18—Engineering Industries Exposition sponsored by New York State Society of Professional Engineers to be held at the Statler Hotel, New York City. John Lanigan is chairman of the exposition.

MAY 20-23-AMERICAN SOCIETY OF MECHANICAL ENGINEERS Second Design Conference to be held in conjunction with Design Engineering Show at the New York City Coliseum. Exhibits will show products which go into the making of other products. These include mechanical, electrical, hydraulic, and pneumatic components; metallic and non-metallic materials; fasteners; finishes and coatings; shapes and forms; and accessories to product development. Further information may be obtained from Clapp & Poliak, Inc., 341 Madison Avenue, New York 17, N. Y.



The real cost of MOTORS

The cost of a motor extends over its entire lifetime. It does not end with purchase price. Cost goes up with every shutdown, every motor maintenance stoppage. Cost stays down when you buy quality. And quality means Allis-Chalmers.

All of these extras that don't show on the Allis-Chalmers nameplate — more copper, more iron, more cooling provisions—exemplify the quality-craftsmanship that goes in before the price tag goes on.

For the "long run," either as a new machinery component or as replacement, specify Allis-Chalmers. Find out more about real quality in motors from your A-C district office or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

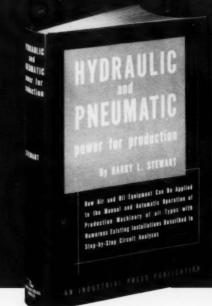
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OR OPERATE HYDRAULIC AND PNEUMATIC EQUIPMENT FOR PRODUCTION MACHINERY



Are you making maximum use of automatic machines and work-handling operations controlled by hydraulic or pneumatic power? Here is a book that provides you with comprehensive, up-to-date information on this subject, which is growing daily in importance as automation becomes more and more widespread.

HYDRAULIC AND PNEUMATIC POWER FOR PRODUCTION shows you:

- ... how to make the most of the advantages of fluid power.
- ...how to choose the equipment, the circuit arrangements and the operating medium best suited for each application.
- ... how to select the right kinds of packings and seals for hydraulic and pneumatic applications.
- ... how to decide on the kind of sequencing to use.
- ... how to analyze equipment for accuracy of control, safety, ease of operation, etc.
- ... how to decide whether to use air or oil to do a particular job.
- ...how to maintain your hydraulic and pneumatic equipment at top operating efficiency.

With the tremendous variety of equipment that is available, and the almost infinite number of circuit arrangements that are possible, it requires expert knowledge to make the most efficient use of hydraulic and pneumatic power — knowledge that takes years of study and experience to acquire. HYDRAULIC AND PNEUMATIC POWER FOR PRODUCTION has been written by an expert who has spent many years in the fluid-power field.

From a wealth of firsthand experience, and with the cooperation of experts and manufacturers of all types of hydraulic and pneumatic equipment, he has brought together information not hitherto available in a single, convenient source . . . information that will be invaluable to the newcomer to the field and that will also serve as a useful reference to those now active in fluid-power work.

Under our Five-Day Free Inspection Plan you may examine HYDRAULIC AND PNEUMATIC POWER FOR PRODUCTION without charge, returning it if you do not find it completely satisfactory. Or, you may save postage charges by sending payment with your order. Same return privilege applies.

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The Evolution of Fluid Power **Hydraulic Fluids** The Hydraulic Power Unit **Hydraulic Accumulators** Fluid Power Lines Hydraulic Valves and Their Functions Hydraulic Cylinders, Intensifiers, and Motors Heat Exchangers for Hydraulic Systems Synchronizing the Movement of Rams **Dual Pressure Hydraulic Systems** Safety Controls for Hydraulic Circuits Sequencing of Hydraulic Cylinder Motion **Packings and Seals** Air Filters, Lubricators and Regulators **Pneumatic Controls** Air Cylinders and Their Design Power-operated Holding Devices **Pneumatic Safety Circuits** Remote Control Pneumatic Systems Combination of Fluids in a Single System

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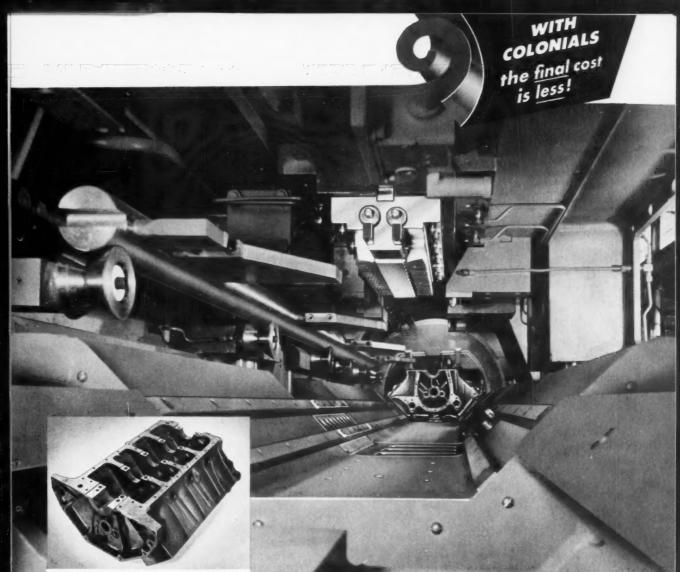
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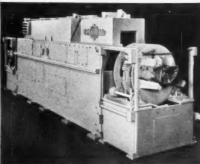
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THE INDUSTRIAL PRESS

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New York 13, N. Y.





The automotive part and the COLONIAL machine. Ten bearing surfaces of this cast-iron cylinder block are overhead broached in one pass at 30 fpm. Automatic cycle time is 29.5 seconds. Positive part positioning keeps broach alignment within 0.0005 inches. Stock removal is 0.025 in. leaving a high-quality surface finish. Chips fall clear.

New cologial Horizontals— A "Tunnel" of Production

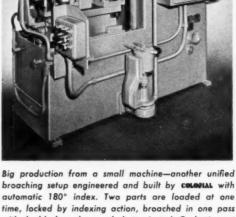
Here's COMMOIAL'S new type horizontal broaching machine—a 6-ton, 54-inch stroke, "tunnel" model designed for automated-line processing of engine-cylinder blocks. Obviously custom-tailored, but still standard enough in concept to be readily used on a wide range of like components. Parts are automatically fed to the machine through a "turn-over" positioning unit for one-pass overhead broaching. Transfer units progressively move the parts into an "elevating" station for broaching. Write for additional details.





Stamping, Then Broaching— Slashes Costs of Hardware

COLOGIAL supplied this installation to a manufacturer of automotive hardware who, when faced with spiraling costs, turned to stamping and broaching. Time and again, broaching's versatility is the way to top efficiency. Your parts and production sales may be unlike this rocker arm assembly but the lesson remains the same. For low volume or high, for more output at reduced cost use broaching and for the best in broaching, use COLODIAL. Our BROACHING NEWS offers a broad picture of application trends and new equipment. A request will bring it regularly.



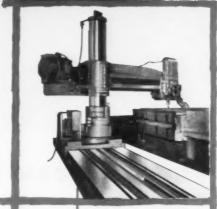
broaching setup engineered and built by councils with automatic 180° index. Two parts are loaded at one time, locked by indexing action, broached in one pass with double broaches, and chute ejected. Cycle time at 100% efficiency, is 6 seconds for both parts. The machine is a 4-ton, 24-inch stroke Ram Press. Details in our Bulletin RP-54. Write for a copy.



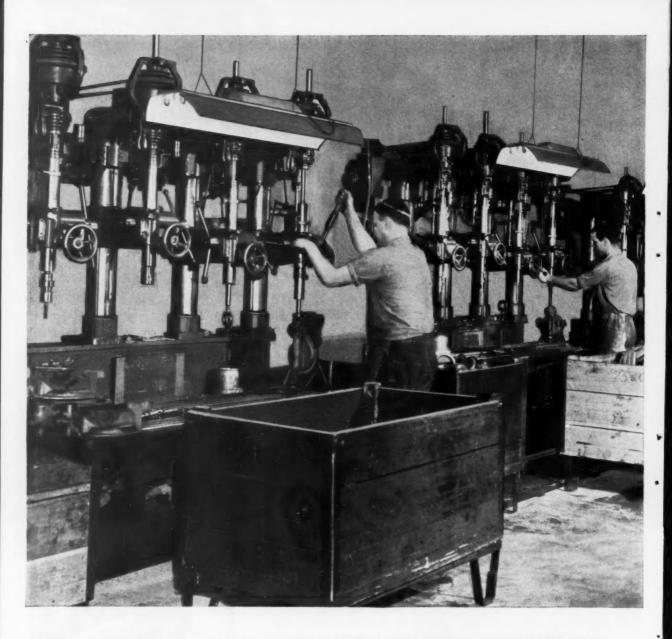


Specialists do the job better: they're on the ball

The fellows most on the ball are those who concentrate on one thing . . . and do it well. Carlton has concentrated on radial drill research, engineering and manufacturing since 1916. This close contact with—and intimate knowledge of industry's drilling requirements—has produced a wide line of the most modern and up to date radial drills. Made in arm lengths from 3-ft. to 12-ft., column diameters from 9" to 26". Programming, pre-select, partial pre-select and manual speed-feed controls, plus special bases, tables and jigs available for additional productivity. The Carlton Machine Tool Co., Cincinnati 25, Ohio.



Carlton SPECIALISTS IN RADIAL DRILLS



"BUFFALO" CAN SPEED UP YOUR TOUGHEST

COMPLEX HIGH-CAPACITY DRILLING, TAPPING OPERATIONS FLOW SMOOTHLY — with a line of "Buffalo" No. 22 Drills like that above, turning out liquid meters at a high rate. Each operator handles 2 to 4 setups without stopping for adjustments, and each spindle has both power and sensitive feed. Note that

all controls are easily reached — these giant 96"-high machines handle as easily as small sensitive drills, yet have 1½" capacity in mild steel! Hand-scraped ways, husky 5.5" dia. columns, precision 6-spline spindles over 1" in least diameter. Write for Bulletin 2989G and see how these quality machines could be increasing your output and cutting costs.











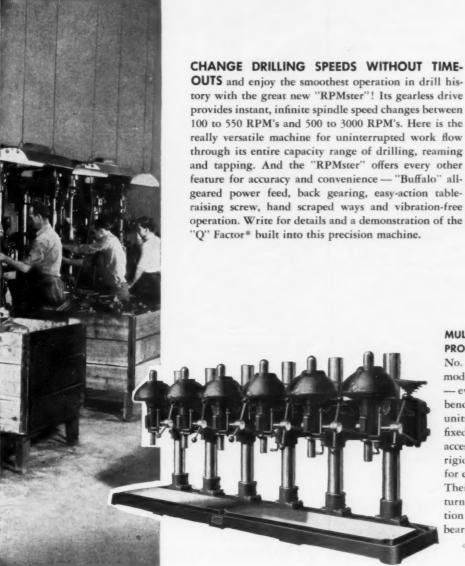


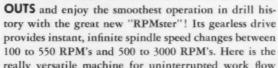
HILLING .

PUNCHING

SHEARIN

BENDING





really versatile machine for uninterrupted work flow through its entire capacity range of drilling, reaming and tapping. And the "RPMster" offers every other feature for accuracy and convenience - "Buffalo" allgeared power feed, back gearing, easy-action tableraising screw, hand scraped ways and vibration-free operation. Write for details and a demonstration of the



MULTIPLE OPERATIONS - HEAVY PRODUCTION UP TO 1"-"Buffalo"

No. 18 Drills are offered in 19 models to fit your operation exactly - everything from single spindle bench or floor models to 6-spindle units for multiple operations on fixed setups - plus a full range of accessories. These are powerful, rigidly built machines, designed for easy adjustment and operation. Their 6-spline alloy steel spindles turn smoothly and without deflection on two sets of precision ball bearings. Write for Bulletin 3123.

The "Q" factor - the built-in Quality which provides trouble-free satisfaction and long life.

DRILLING OPERATIONS

SMALL JOBS UP TO 1/2"—OR CONTINUOUS PRODUCTION

The "Buffalo" No. 15 Drill has the adaptability and the stamina for both! Choice of 15 single and multiple spindle models and arrangements, full selection of accessories. Quick, handy adjustments and fatigue-free operation. A full-time production machine, too, with its 6-spline ball bearing spindle and overall husky construction. Write for Bulletin 2963G - there's a "15" tailor-made for your operation!

BUFFALO FORGE COM

440 BROADWAY

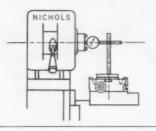
BUFFALO, N.Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.



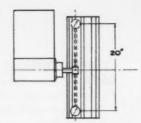
For more information fill in page number on Inquiry Card, on page 253

MACHINERY, April, 1957-271



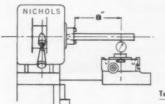
Spindle Taper Runout
Allowable Error .00015

Test .000/



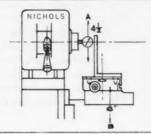
Right Angularity of Table to Spindle Allowable Error .001

Test . 0002



Spindle Runout on 8" Mandrel Allowable Error .001 F.I.R.

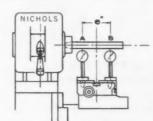
Test .0002



A—Squareness of Head Slide to Top of Knee Allowable Error .0005 B—Parallelism of Head & Knee Slides on Column Allowable Error .0005

Tost

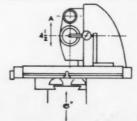
A. . 0002 B. 0001



Parallelism of Spindle to Table Allowable Error

A. .0000 B. -.0005

Test B .0002

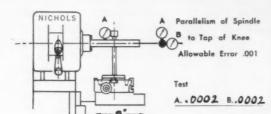


B—Parallelism of Head & Knee Slides on Column

Allowable Error .0005
A—Sq rareness of Head
Slide to Top of Saddle
Allowable Error .001

Test

A.. 0001 B. . 0002



ACCURACY TESTS FOR NICHOLS HAND MILLER

Ser. No. 5-V-6373 Inspector R.Z. Le Vert Date 6-8-56

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NICHOLS MILLER TEST SHEET



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Available in hand, automatic and double spindle models.

Write today for general catalog. A sound, color movie, "The Miller that Uses its Head", is available for free showing. May we reserve it for you?

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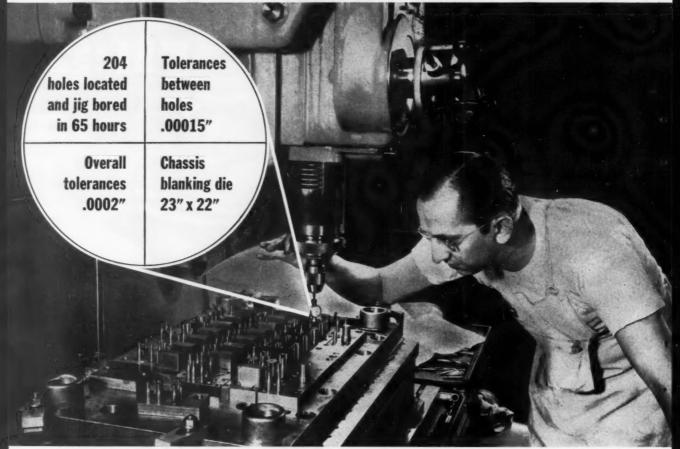


GEARS FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS

GEAR-MAKERS TO LEADING MANUFACTURERS



Why Lindner Optical Jig Borers have changed so many ideas about jig boring



MODEL LB15 (WITHOUT AUTOPOSITIONER) AT MIDDLESTADE

You're looking at the *third* Lindner Optical Jig Borer at work for Middlestadt Machine Co., Baltimore. And you'll see *seven* Lindners at General Electric; *five* at North American Aviation; *three* at Avco; others at General Mills, Lockheed, Vectron, Bendix—and a growing list of more precision-minded plants. Here's why:

Optical measuring system does not depend on lead screws, gage blocks, bars or limit switches—is permanently protected against mechanical wear. Only a light beam touches helically scribed cylindrical measuring scales which are independent of table movement mechanism and are *immovable* in axial direction.

AUTOPOSITIONER® enables operator to preselect table position for next hole while one boring operation is in progress—eliminates non-productive time between

holes. As one hole is completed, table moves in rapid traverse to the next preselected position. (Available only on model LB15A)

Photo-electric optical centering device minimizes visual fatigue and errors in settings—permits initial and repeat settings guaranteed accurate within .00015" and readings in .00005".

Projection screen eliminates operator eye strain and bending—helical line from measuring scale is projected on $2\frac{1}{2}$ " x $\frac{3}{4}$ " screen which operator reads in standing position without eyepiece.

Automatic table clamping prevents errors in clamping and unclamping table between movements.

Lindner Optical Jig Borers are available in two models: LB15A with Autopositioner-Table size 44" x 24" LB14-32" x 16" (without Autopositioner)

• Send for 25-minute movie film demonstration



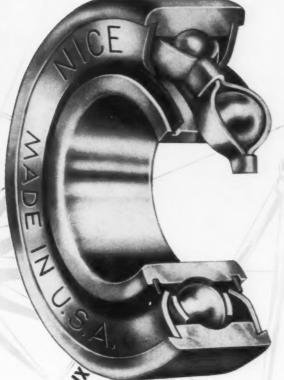
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TO BE SURE OF YOUR BEARINGS!

QUALITY

4.PERIENCE



37NJHJA

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DEPENDABILITY

YTIJAUO

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NICE BALL BEARING CO.

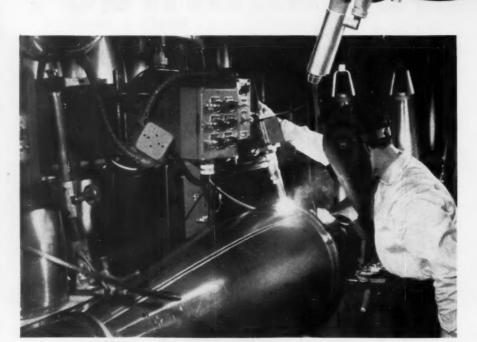
NICETOWN - PHILADELPHIA - PENNSYLVANIA

For more information fill in page number on Inquiry Card, on page 255

MACHINERY, April, 1957-275

New AIRCOMATIC HEAD

for better machine welding



New AMH-B Head welding cylindrical containers on a high production basis. All components of this Aircomatic package - power supply, inert gases, and Aircomatic welding wire— are available from Airco.

The new improved Airco AMH-B Aircomatic Head has been developed for the fabrication of ferrous and nonferrous metals on a high production basis. Used in conjunction with constant arc voltage power supply, this unit provides automatic control of the arc voltage. Standard shielding gases-argon, helium, mixtures (AG75) and CO2 - are used. Advantages of the AMH-B include: two speed ranges, up to 900 inches per minute high range, and up to 600 inches per minute low range; all types of Aircomatic

welding wire, from .030" to 3/32" diameters, can be used. Wire is fed at a constant speed by an adjustable speed

motor. Easy adjustment of the head allows it to be used vertically or horizontally.

For handling most applications the basic package consists of the Aircomatic unit, a machine barrel and a wire guide component kit. The basic Aircomatic unit includes the head, main control panel and remote control operator's station. For complete information write Airco direct.

welding AT THE FRONTIERS OF PROGRESS YOU'LL FIND





A division of Air Reduction Company, Incorporated 150 East 42nd Street, New York 17, N. Y.



9-11, 1957 . PHILADELPHIA, PA.

On the west coast — Air Reduction Pacific Company

Internationally — Airco Company International

In Cuba — Cuban Air Products Corporation

In Canada — Air Reduction Canada Limited

Products of the divisions of Air Reduction Company, Incorporated, include: AIRCO — industrial gases, welding and cutting equipment, and acetylenic chemicals • PURECO — carbon dioxide, liquid-solid ("DRY-ICE") • OHIO — medical gases and hospital equipment • NATIONAL CARBIDE — pipeline acetylene and calcium carbide • COLTON — polyvinyl acetates, alcohols, and other synthetic resins.

276-MACHINERY, April, 1957

most principal cities

For more information fill in page number on Inquiry Card, on page 255

PRECISION PETE SAYS:

Only Thompson
Type 2F Grinder
has all three
available...



... COOLANT
EXTERNALLY ON
THE WORK ...

...AND
"IN POSITION"
WHEEL
TRUING

COOLANT

THRU THE

Thompson Type 2F 8" x 10" x 24" surface grinder

MANUFACTURERS

OF THE WORLD'S

MOST COMPLETE LINE

OF SURFACE GRINDERS

WRITE TODAY FOR DESCRIPTIVE DATA

THE THOMPSON GRINDER COMPANY
SPRINGFIELD, OHIO

Thompson surface Grinders

Copyright 1956 The Thompson Grinder Compan

OSBORN BRUSHING METHODS worthy of your confidence



BEFORE BRUSHING



AFTER BRUSHING

Centerless Brushing Method

quickly produces precision finish



Osborn Matico Brush puts final finish on aluminum pistons.

WHEN it comes to precision finishing of cylindrical parts, Osborn's Centerless Brushing method does the job quickly and efficiently.

The aluminum pistons shown above are fed across the face of an Osborn Matic® Bufcut® Brush mounted on a standard centerless grinder. Feather burrs are thoroughly removed, surface junctures blended, and surface finish refined . . . automatically and economically

A wide range of cylindrical parts can be processed in a similar manner.

An Osborn Brushing Analysis, made in your plant at no obligation, will demonstrate how Osborn Power Brushing Methods can help automate your operations...improve your product. The Osborn Manufacturing Company, Dept. D-33, Cleveland 14, Ohio.

Write Today for the new 100-page Osborn Catalog 210-C.

Osborn Brushes

BRUSHING METHODS . POWER, PAINT AND MAINTENANCE BRUSHES . BRUSHING MACHINES . FOUNDRY MOLDING MACHINES

278-MACHINERY, April, 1957

For more information fill in page number on Inquiry Card, on page 255

VANADIUM-ALLOYS STEEL COMPANY

FIRST QUALITY

High Speed Steels

wherever outstanding cutting performance

must be matched with practical

economy on industry's most exacting jobs

Vasco Supreme

Neatro

Van Cut

The supreme high speed steel, providing highest hardness, highest hot hardness, highest wear resistance, highest cutting efficiency. (U.S. Pat. 2,174,285)

For heavy, light and intermittent cuts on heat-treated steels and abrasive materials. Extremely high abrasion resistance, exceeded only by Vasco Supreme. (U. S. Pat. 2,174,286)

Molybdenum-tungsten type, combining ease of grinding with improved wear and heat resistance. Suitable for all types of cutting tools.



Red Cut Superior

Vasco M-2

8-N-2

Van-Lom

America's favorite general-purpose high speed steel. Easy to fabricate, simple to heat treat. Wide choice of carbon content, for almost limitless uses.

The original 6-6-2 type steel. Machines easily, has wide hardening range, can be ground normally when hardened. Excellent economy in general service.

Molybdenum type, low in tungsten. High toughness, for fine edged tools and sharp angles without chipping or crumbling. Substitutes well for 18-4-1.

Out-cuts other high-moly steels. Special vanadium content permits increased carbon (U.S. Pat. 2,105,114) without brittleness, for greater toughness, wear resistance.

Write for useful Data Sheets

Vanadium-Alloys Steel Company

Latrobe, Pennsylvania

SUBSIDIARIES: Colonial Steel Co. • Anchor Drawn Steel Co. • Pittsburgh Tool Steel Wire Co. • Vanadium-Alloys Steel Canada Limited • Vanadium-Alloys Steel Societa Italiana Per Azioni



Scott Wipers are used at Centralab Division of Globe-Union Inc., where electrical circuits are being painted. Scott Wipers are 2-ply paper, chemically treated and "perf-embossed." This exclusive process® creates angled surfaces which provide thorough cleansing action and speed absorption of liquids.

WIPER PROBLEM? Look what Centralab did with Scott Wipers!

Versatile Scott Wipers are especially useful in operations where products or equipment must be kept free of lint. This is one of the most important reasons why they are used extensively by the Centralab Division and three other plants of Globe-Union Inc., Milwaukee, Wisconsin.

Among many electronic developments pioneered by the Centralab Division is the metalizing of ceramic capacitors, or "packaged electronic circuits." This involves painting ceramic wafers with conductive silver, through fine-mesh screens. Scott Wipers are used to wipe screens clean. Since these paper wipers are lint-free, as well as highly absorbent, they are ideal for this purpose. In addition, the silver is readily salvaged from used wipers.

Scott Wipers are used for a wide variety of industrial wiping jobs, including those requiring solvents. Want more details? Call the local Scott representative or distributor. Or write Scott Paper Company, Department M-74, Chester, Pennsylvania.



SCOTT PAPER COMPANY

Makers of the famous Scott paper products you use in your home.

Consult your local TV schedules for Scott's program, "Father Knows Best."

*Patent pending



If you have a heat-treating job like this

You need an **Induction Heating Machine** like this



New TOCCOtron Machine 50 kw 500,000 cycles

For many years TOCCO has led the Induction Heating Field-manufacturing both motor-generator and vacuum tube oscillator type machines to meet every induction heating requirement. This new 50 KW TOCCOtron unit is a big brother to the 25 KW unit which has been serving the Metal-Working Industry for many years.

With a frequency range of 350,000 to 600,000 c.p.s. the TOCCOtron unit is ideal for surface hardening small diameter parts to shallow depths (as the bearing race illustrated above), through hardening or annealing small sections and soldering or brazing small assemblies where the heating effect must be very strictly localized.

The greater capacity of the new 50 KW TOCCOtron doubles production rates formerly achieved by TOCCOtron equipment.

A Really Complete Machine

This radio frequency unit is a truly complete induction heating machine. It contains not only all the direct current supply components and the oscillator components, but also all the control components required for either single or two station operation.

Among the standard features of the 50 KW TOCCOtron are:

- 1. The industrial heavy gauge steel cabinet which completely encloses all high potential circuits preventing radiation interference and personnel hazards.
- 2. Meters in all sensitive circuits to enable the user to obtain the maximum output and efficiency.
- 3. 3-phase quadrature filament excitation of rectifiers for maximum life.
- 4. Externally adjustable grid bias and drive control for ease in setting up new production runs.

- 5. Externally mounted circuit breaker and disconnect located so that it is easily accessible.
- 6. Tapped plate transformer allowing variations of plate voltage.

If your operation requires the hardening, annealing or brazing of very small parts in very big quantities the new 50 KW TOCCOtron can do the job better, faster and at lower cost than any other method available.



THE OHIO CRANKSHAFT COMPANY

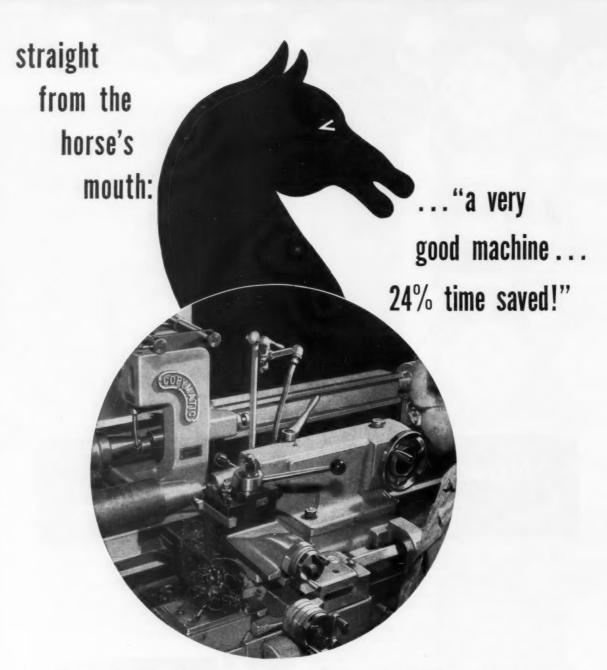
Mail Coupon Today - NEW FREE Bulletin

The Ohio Crankshaft Co. . Dept: M-4, Cleveland S, Ohio

Please send catalog G showing TOCCO Induction Heating Equipment from 60 to 600,000 cycles.

Company

Address.



When a famous machine tool manufacturer reports on the performance of another's product, it is an opinion you can count on as authoritative.

The Ingersoll Milling Machine Company of Rockford, Illinois is one of the early owners of a new Lodge & Shipley 16 $^{\prime\prime}$ POWERTURN 90 $^{\circ}$ COPYMATIC Lathe. Used in turning cutter housings and shanks, shafts and spindles, the lathe has

proved very good, judged on performance, construction, accuracy and versatility.

If you want eye-witness proof of similar significant savings on your lathe production, the Lodge & Shipley Demonstration Room is at your service. Contact your Lodge & Shipley distributor for details or write direct to: The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

JOB FACTS

WORKPIECE: 4" Diameter Cutter Housing OPERATION: Turn complete including taper MATERIAL: 4140 HR Steel

CUTTING TOOLS: Carbide FEED: .018" per rev.

SPEED: 431 RPM

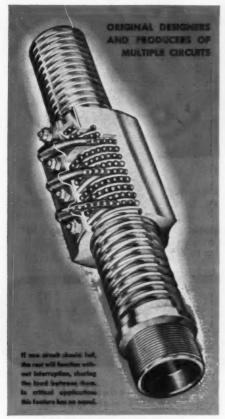
TIME: Floor-to-Floor: approx. 35 min.

RESULTS: 24% time saved

Lodge & Shipley

SAGINAW b/b SCREWS are guaranteed 90% EFFICIENT!

Require 4/5 LESS torque than Acme Screws for same linear output on Actuator and Positioner Applications! Saves space, weight!



WHAT IT IS AND HOW IT WORKS



Let's start at the beginning, with the familiar principle that there's far less friction in rolling than in sliding. By ap-plying this principle,



the Saginaw ball bearing Screw radically increases the efficiency of rotary-to-linear motion (and vice versa). Instead of stiding, mating surfaces glide on rolling steel balls.

SIX DESIGN ADVANTAGES

- 1. Vital Power Savings. Permit much smaller motors with far less drain on electrical system, simpler circuitry.
- 2. Space/Weight Savings. Screws themselves are smaller, lighter; permit smaller motors and gear boxes; eliminate auxiliary equipment required by hydraulies.
- 3. Precise Positioning. Machine-ground type will position components far more precisely than hydraulies or pneumatics; tolerances on position are held within .0006 in./ft. of travel.
- 4. Temperature Tolerance. Normal operating range from -75° to +275° F.; in selected materials, will function efficiently as high as
- 5. Lubrication Latitude. If lube fails, will still function with remarkable efficiency. Units have been built and qualified for operation without lubrication.
- 6. Fail-Safe Performance. Far less vulnerable than hydraulies; Gothic-arch grooves, yoke deflectors and multiple circuits provide added assurance against failure.

NAME



Like stripes on a barber pole, the balls travel to-ward end of nut through spiral"tunnel"formed by concave threads in both screw and mating nut.



At end of trip, one or more tubular guides lead balls diagonally back across outside of nat to starting point, forming closed circuit through which balls recirculate.

SAGINAW b/b SPLINE



Utilizing the same basic gliding ball principle. Saginaw has developed the Saginauc b/b Spline which radically increases the efficiency of transmitting or restraining high torque loads.

Averages 40 times lower friction coefficient than sliding splines!

It can be fitted with integral gears, clutch dogs, bearing and sprocket seats, etc., for use with a wide variety of electrical units. Units have been built from 3 inches to 10 feet long-3/8 to 6 inches in diameter.

Available in custom machine-ground and stock rolled-thread types. Units have been built from 11/2 inches to 391/2 feet long-1/8 to 10 inches in diameter.



SAGINAW STEERING GEAR DIV., GENERAL MOTORS CORP., SAGINAW, MICH.

SEND COUPON FOR NEW 1967 ENGINEERING DATA BOOK

er see our section in Sweet's Product Design Pffe

Saginaw Steering Gear Division, General Motors Corp. b/b Screw and Spline Operation

Dept. 6Y, Saginaw, Michigan

Please send new engineering data book on Saginaw

b/b Screws and Splines to:

COMPANY ZONE STATE CITY_

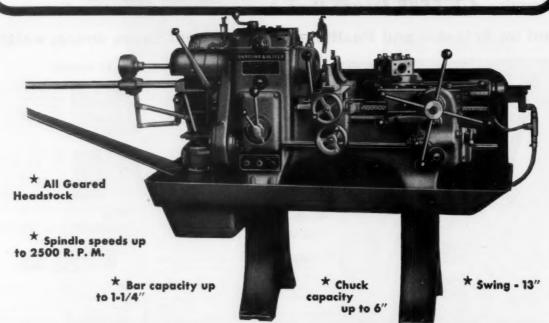
For more information fill in page number on Irquiry Card, on page 255

MACHINERY, April, 1957—283

The BARDONS & OLIVER

No.2 GEARED

Turret Lathe Handles **BOTH**BAR and CHUCK WORK



Why buy two Machines ... When ONE will do the Job?.. Check these Outstanding Features



Write For New Catalog
On Your
Company Letterhead

- Only tenths of a second for spindle reversing and two to one speed changing.
- Permissible spindle reversals up to 10 cycles per minute.
- Twelve unduplicated quick speed changes in several optional ranges.
- Instantaneous Dynamic spindle brake.
- Headstock redesigned to deliver 25% more power.
- Automatic spindle reverse and speed change actuated by the operating cycle of the hexagon turret (optional extra).
- Redesigned heavy duty turret slide and saddle for greater accuracy, longer life, and quicker indexing.

Manufacturers of a complete line of Turret Lathes and Cutting-off Lathes

BARDONS & OLIVER, Inc.

1135 WEST 9TH STREET

CLEVELAND 13. OHIO



"TRUKUT" increased production
4 times..."



A small Mid-Western machine shop was confronted with an economic problem — production costs were too high — tool life was too short. While engaged in the job of cutting threads on 1020 16-gage electric welded steel tubing, the shop called in Sinclair Representative Raymond F. Ohm for help.

Mr. Ohm reports: "Tool life was a maximum of only 100 pieces before burning took place. Thread was very rough, due partly to chatter because of thin wall of tube."

"I recommended Sinclair TRUKUT® EP Soluble Oil, Grade C, because it affords greater emulsion stability, longer tool life and better finishes with close tolerance. It also gives a greater cooling and load-carrying capacity to prevent tool welding and burning."

"With TRUKUT, production has been increased four times. Four hundred or more pieces are produced before tool is replaced. Also — finish of threads is finer, and general appearance of the finished piece is better."

"The shop found TRUKUT EP, Grade C, so satisfactory that it now uses TRUKUT exclusively."

If you have a problem with cutting or grinding coolants, it will pay you to look into the advantages of Sinclair TRUKUT EP Soluble Oils. Contact your local Sinclair Representative, or write to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. There's no obligation.

DINO, the Sinclair Dinosaur, says:

CONTACT YOUR

SINCLAIR REPRESENTATIVE

NOW!

SINCLAIR

CUTTING OILS and COOLANTS

For more information fill in page number on Inquiry Card, on page 255

MACHINERY, April, 1957-285

A Multipress case study



MULTIPRESS® ends rejects of plastic toy assemblies for Lionel

ASSEMBLING plastic and powdered metal toys with mechanical presses resulted in excessive scrap losses at Lionel Corporation. Then Multipress tackled the job, and rejects were a forgotten profit-taker.

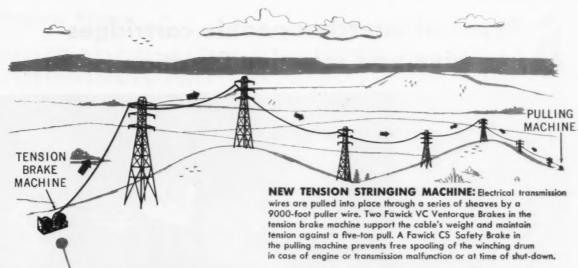
With Denison's hydraulic Multipress, the ram stroke adapts itself automatically to variations in material thickness, delivers only the exact pressures required. No more loose assemblies because of inadequate ram pressure; no more fractured parts caused by excessive pressure.

Lionel also found that workers prefer the quiet, safe hydraulic operation of the Multipress . . . and lost time in tooling changes and maintenance has been cut to a minimum.

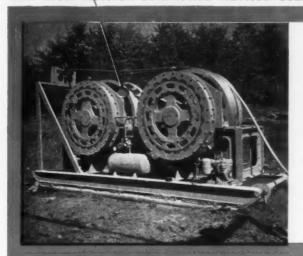
Let a Multipress expert show you how to improve your production methods...cut costs. Write Denison Engineering Division, American Brake Shoe Co., 1244 Dublin Road, Columbus 16, Ohio.



HYDRAULIC PRESSES . PUMPS . MOTORS . CONTROLS



NEW HIGH-TENSION STRINGING METHOD USES FAWICK VENTORQUE BRAKES FOR ...



mighty grip despite sustained slip

TENSION BRAKE MACHINE: Air pressure in the actuating tubes of the two Fawick VC Ventorque units regulates play-out speed of $1\,\%$ " aluminum cable.



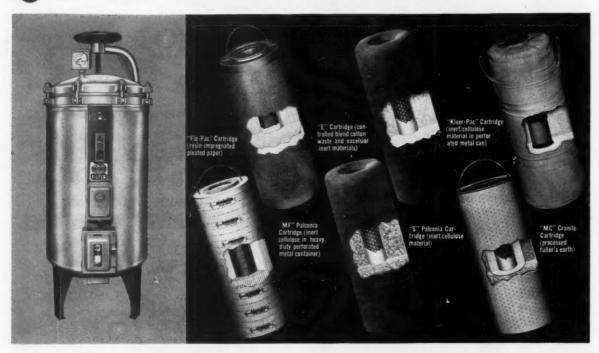
Tension stringing, a new method for simplified erection of power lines, has been proved in service by Hoosier Engineering Company of Columbus, Ohio. Lightweight aluminum conductor cable is removed from shipping reels under controlled tension, and installed on towers without use of supporting structures.

Equipment for this method, designed and built by McJunkin Corporation of Charleston, W. Va., uses two Fawick VC Ventorque Brakes to control the steady playout of the cable. Fawick's completely ventilated design prevents overheating of the friction shoes despite constant slippage. They maintain a tight grip to stop excess sagging and prevent dropping of the cable—safety is assured. Fawick products are performing many heavy-duty jobs throughout industry. For more information, contact your nearest Fawick Representative or the Home Office. Ask for Bulletin 500-A.

FAWICK AIRFLEX DIVISION
FAWICK CORPORATION

9919 CLINTON ROAD . CLEVELAND 11, OHIO

Types of interchangeable cartridges give you selective filtration



Reduce Wear-Improve Finish-Protect Equipment-Lower Cost WITH MULTI-CARTRIDGE FILTERS

Selective filtration is yours under all operating conditions with CFC (formerly Honan-Crane) Multi-Cartridge Filters. Through years of research and field experience, CFC engineers have developed a full range of filter media to meet your job requirements in: cutting, grinding, quenching and rolling-mill oils; water-based coolants; hydraulic oils; fuel and lubricating oils; air filter oils. Determine the job requirements first — nature and degree of contaminants, viscosity and temperature, clarity and flow rate. There is a CFC high efficiency filter cartridge to do the job.

In addition to the complete flexibility of filter media, CFC Filters have quick-opening covers, and can be equipped with electric, steam or hot water heat. Auxiliary equipment, such as pumps, motors and electric controls, may be included with either stationary or portable filters.

CFC Multi-Cartridge Filters give you dependable, money-saving protection against wear and breakdown due to contamination. You quickly save enough through reduced maintenance and improved efficiency to pay the low initial cost of these filters which are available in a full range of sizes from one to twenty-four cartridges.

A Commercial Filters engineer will gladly demonstrate how you can increase production and save money by installing these modern Multi-Cartridge Filters. Call your nearest Commercial Filters representative or sales office — or write to Department MA for technical literature.

Micro-Fine Filtration for Low Cost Clarity

COMMERCIAL FILTERS CORPORATION

MELROSE 76, MASSACHUSETTS

Plants in Melrose, Massachusetts and Lebanon, Indiana



FULFLO FILTERS WITH GENUINE HONEYCOMB FILTER TUBES FOR CONTROLLED MICRONIC CLARITY • CFC MULTI-CARTRIDGE OIL FILTERS PURIVAC INSULATING OIL CONDITIONERS • DRI-PURE WATER-OIL SEPARATORS • PRE-COAT FILTERS • MAGNETIC SEPARATORS

288-MACHINERY, April, 1957

SCHRADER AIR PRODUCTS CAN MAKE PRECISION OPERATIONS EFFICIENT

Let's clear the air about close tolerances

We've faced it. Lots of manufacturers still think air is as unpredictable as the weather report. But others know better, because they've taken the time to let a little sunlight on the subject. These open-minded ones are utilizing Schrader Air Products, not just to hold work or blow away chips, but to produce complex units to close tolerances.

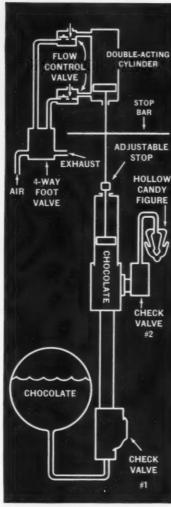
Air is a big boy now. It has grown up fast because automation came because pennies needed pinching. Because many operations in manufacturing turned out to be just plain dangerous. Then engineers found air was not only efficient, economical, and safe, but that products were already designed and produced to make air a logical way of performing hundreds of special jobs.

FOR EXAMPLE:

Sweet words about air from a candy maker

At a Buffalo, New York, candy company, Schrader Air Products have been used to perform a complex measuring operation. To within one gram! Six Schrader double-acting cylinders are used to fill a bank of six more single-acting cylinders with a prescribed amount of chocolate. When a foot valve is released, the chocolate is forced into wax figurines, exactly filling them. And the entire installation is even covered and kept at a constant temperature to insure the proper chocolate viscosity.

Take a look at the schematic. It shows the arrangement by which the Schrader Air Products are adapted to an operation which might at first seem far outside the limits of air use. It was



Schematic shows how Schrader Air Products are adapted for precision handling of liquid chocolate.

possible because some engineers put on their thinking caps.

Talk about air's advantages being automatic—lend an ear

This is important to you, so don't wander off. When air is used to synchronize motions automatically, efficiency is almost sure to follow. BUT, the natural advantages of air multiply like rabbits. For instance, economy is basic. In many cases it can make the difference between profit and loss. Then, safety margins are widened by the use of special control techniques. Air's simplicity makes possible easy finger-tip and tiptoe operation of tiring hand and foot movements. Fatigue? Who's tired? Production goes up. Modern packaged control sets are so highly developed that most hazards of press operation are no longer applicable. Both hands must be used at once, and cannot stray into danger zones. Any machine using a mechanical clutch, shears, brakes and friction clutches can use special controls.

We <u>like</u> to be taken advantage of

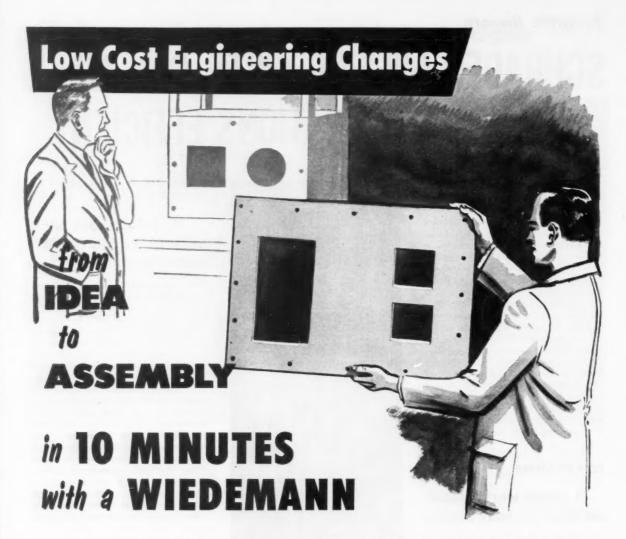
You can make use of Schrader's engineering facilities. That's why we have them. Upon request, Schrader engineers will assist in planning for the most efficient use of air in your plant, and in selecting the products best suited to a given application. Distributors are conveniently located to deliver Schrader Products in the shortest possible time.

Write to Schrader for information. Address A. Schrader's Son, Division of Scovill Manufacturing Company, Incorporated, 45% Vanderbilt Avenue, Brooklyn 38, N. Y.



FIRST NAME IN THE USE OF AIR

FOR INDUSTRIAL PRODUCTION AND CONTROL



When the job on the left was assembled, the need for engineering changes in the mounting plate was evident. Greater rigidity was required. Openings were of wrong size and incorrectly placed. Hours of valuable production time could have been lost—but, using a Wiedemann Turret Punch Press, the new part was ready for assembly in less than 10 minutes after the change was ordered.

Whether simple or complex, on-the-spot engineering changes can be made at

amazingly low cost. This is just one of the many ways the Wiedemann Method cuts short run piercing costs 60% to 90%. Want proof? Send drawings of your work for a time study and write for Bulletin 201.

There's a Wiedemann for every short run piercing requirement.

MACHINE COMPANY

4205 Wissahickon Ave. · Philadelphia 32, Pa.

For more information fill in page number on inquiry Card, on page 255

CUSHMAN

the answer to precision workholding

SUSHWANS OF THE SUSTAINANT OF

MANUALLY OPERATED CHUCKS

AIR OPERATED CHUCKS

CUSHMAN POWER WRENCHES

ACCRA-SET CHUCKS

JET ENGINE CHUCKS

CUSHMAN CHUCKS GIVE CHUCK-ABILITY

—The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . . through design and selection of the right workholding devices.



CUSHMAN CHUCKS ...

a Product of American Quality, Labor and Materials

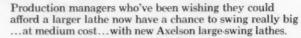
SOLD THROUGH YOUR INDUSTRIAL DISTRIBUTOR

THE CUSHMAN CHUCK COMPANY

Hartford 2,

Connecticut

LARGE swing...medium cost ...with new Axelson lathes



Axelson's 44", 48" and 60" lathes are ready to go to work on the job of producing profits from big, odd-shaped pieces that ordinary lathes can't handle.

Operators will take pride in the flexibility of these lathes, which can take on the biggest pieces in the shop... then swing quickly into action on smaller jobs. Big, healthy bites and small, precision cuts are all in a day's work.

Quick shifting of the 24-speed headstock produces spindle speeds from 6 to 750 r.p.m., forward or reverse, in true geometric progression.

Tailstocks are rugged one-piece castings that absorb the twist-turn punishment of heavy machining... eliminate inaccuracies caused by bolt stretch. Movement of the two-speed tailstock spindle can be fast or slow, easily controlled by the operator to meet his needs.

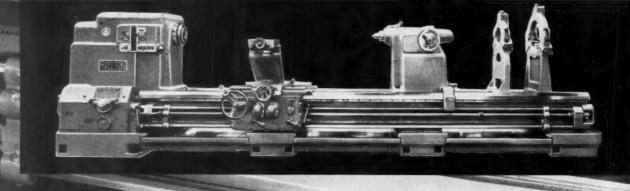
Two levers control all 81 feeds and 45 leads. Apron-located feed controls are positive-action, serrated-tooth type, requiring only light finger pressure for engagement.

For more information about these large-swing lathes ... at medium cost ... call your nearest Axelson representative or write for Bulletins M4-5508 (44"), M4-5510 (48"), and M4-5509 (60").



AXELSON MANUFACTURING COMPANY

Division of U. S. Industries, Inc. 6160 S. Boyle Avenue, Los Angeles 58, California



Standard Duty Model 6049 – 60" swing, 40 hp. (above) Standard Duty Model 4836 – 48" swing, 60 hp. Heavy Duty Model 4431 – 44" swing, 75 hp.

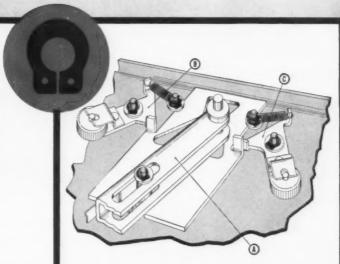
Waldes Truarc grip rings used on die-cast studs eliminate threading, tapping, other costly machining



Mark Simpson Manufacturing Co., Long Island City, N. Y., uses Waldes Truarc series 5555 Grip Rings to secure parts to studs of the zinc die-cast base of its "Masco 500" portable tape recorder.

portable tape recorder.

The rings—which need no grooves—replace nuts, screws, cotter pins and other types of fastening devices which require threading, tapping, drilling and other expensive machining operations. Because a single cracked or broken stud would render the entire cast base useless—and with it, all assembly completed to that point—the rings also eliminate extremely costly rejects.



Pivot Assembly of shift lever (A) is secured by a single Waldes Truarc Grip Ring and washer. Because the washer must be installed over the shift level in a sliding fit, critical tolerances would have to be maintained if a screw or cotter pin were used. The Truarc Grip Ring eliminates that problem: it requires no groove and may be seated over the washer at any point on the stud, automatically compensating for accumulated tolerances in the parts. BRAKE ASSEMBLIES (B and C) use Grip Rings to secure the brake wheel and spring subassemblies. Here again problems of critical tolerances are avoided and expensive rejects eliminated.

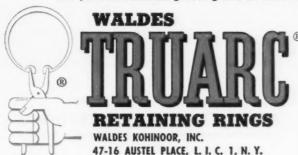
Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product...to save you material, machining and labor costs. They're quick and easy to assemble and disassemble, and they do a better job of holding parts together. Truarc rings are precision engineered and precision made, quality controlled from raw material to finished ring.

36 functionally different types...as many as 97

different sizes within a type...5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U. S. A. and Canada.

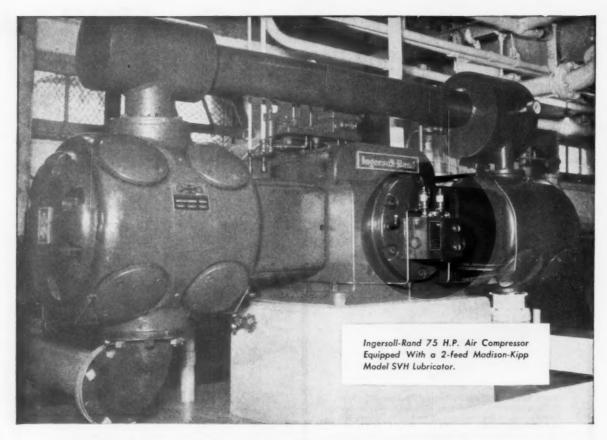
More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today...let our Truarc engineers help you solve design, assembly and production problems...without obligation.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!



	new supplement No. 1 which atalog RR 9-52 up to date. (Please print)
Name	
Title	
Company	Annual Committee of the
Business Address	to the state of th
City	Zone State

WALDES TRUARC Retaining Rings, Grooving Tools, Pilers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.



Machines of great performance use the most dependable oiling system ever developed MADISON-KIPP

. . by the measured drop,

from a Madison-Kipp Lubricator is the most dependable method of lubrication ever developed. It is applied as original equipment on America's finest machine tools, work engines and compressors. You will definitely increase your production potential for years to come by specifying Madison-Kipp on all new machines you buy, where oil under pressure fed drop by drop can be installed. There are 6 models to meet almost every installation requirement.



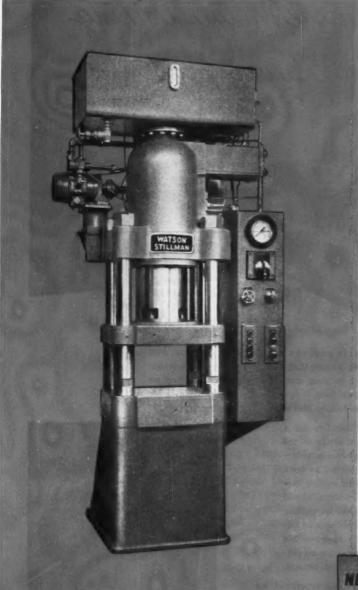
ET . MADISON IO, WIS., U.S.A.

- Skilled in Die Casting Mechanics

 Experienced in Lubrication Engineering

 Originators of Really High Speed Air Tools

NEW AND FLEXIBLE!



the Watson-Stillman 150-ton general-purpose press

This new 150-ton general-purpose press is just what you need for flexible, lowestcost production. It was designed specifically for short production runs in:

- Metal forming
- Straightening
- Coining
- Forging
- Light hobbing
- General testing
- Die tryout

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WRITE FOR FREE FOLDER — Bulletin 371 details the many features of the machine and gives specifications and die space dimensions.



WS-27



You are invited to view, in your own plant at a time of your own choosing, a sound moving picture that well may cause you to reconsider the whole approach to your metal turning processes. And we predict that you will wish to have it re-run, perhaps several times, for selected management, production and engineering personnel.

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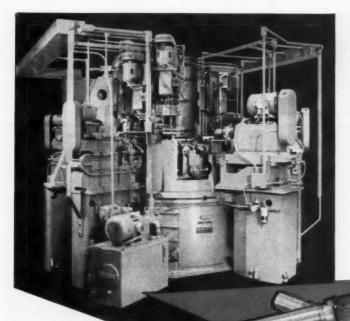
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...including
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MACHINE TOOL COMPANY 946 HARRIET STREET CINCINNATI 3, OHIO

Product Directory

To find headings easily, look for capital letters at top of each page to denote location.

ABRASIVE CLOTH, Paper and Belt

Carborundum Co., Niagara Falls, N. Y. Crane Packing Co., Morton Grove, III.

ABRASIVES, Discs

Besley-Welles Carp., 112 Dearborn Ave., Beloit, Wis. Carborundum Co., Niagara Falls, N. Y. Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.

Gardner Machine Co., Beloit, Wis. Norton Co., 1 New Bond St., Worcester, Mass. Simonds Abrasive Co., Tacony and Fraley Sts.. Bridesburg Philadelphia, Pa.

ABRASIVES, Polishing, Tumbling, Etc.

Carborundum Co., Niagara Falls, N. Y. Crane Packing Co., Morton Grove, III. Cratex Manufacturing Co., 81 Natoma St., San Francisco, Calif.

Norton Co., 1 New Bond St., Worcester 6, Mass. Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic

Elmes Eng. Div., Paddock Rd. & Tennessee Ave., Cincinnati, Ohio Erie Foundry Co., 1253 W. 12th St., Erie, Pa. Watson-Stillman Co., Roselle, N. J.

AIR GAGES, Dimensional-See Gages Air Comparator

AIR GUNS

Chicago Pneumatic Tool Co. New York 17, N. Y. Schrader's Sons, A., 470 Vanderbilt Ave., Brooklyn 38, N. Y.

AIR TOOLS—See Grinders, Portable, Pneumatic Drills, Portable, Pneumatic,

ALLOY STEELS

ALLOY STEELS

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Columbia Tool Steel Co., Chicago Hts., III. Crucible Steel Co. of America, Oliver Bidg., Pittsburgh 30, Pa. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa. Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa. Vanadium Alloys Steel Co., Latrobe Pa. Wheelock, Lovejoy & Co., Latrobe Pa. Mass.

ALLOYS, Bearing

Bunting Brass & Bronze Co., 715 Spencer Toledo 1, Ohio. Carpenter Steel Co., 105 W. Bern St., Reading, Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Square, Pittsburgh 22, Po. Mueller Brass Co., Port Huron, Mich.

ALLOYS, Non-ferrous-See Brass, Copper, Zinc and Stellite

ALUMINUM and Aluminum Products

Mueller Brass Co., Port Huron, Mich. Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y. Ryerson & Son, Jos. T., 16th & Rockwell Sts., Chicago 8, Ill.

ANGLE PLATES-See Set-Up Equipment

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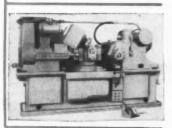
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Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
Jacobs Mfg. Co., West Hartford, Conn.
Kearney & Trecker Corp., Milwaukee 14, Wis.
Logansport Mch. Co., Inc., Logansport, Ind.
South Bend Lathe Wks., South Bend 22, Ind.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

ARC WELDERS-See Welding Equipment, Arc

AUTOMATIC SCREW MACHINES—See Screw Machines, Single- and Multiple-Spindle Automatic

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Gisholt Machine Co. Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.
LaSalle Tool, Inc., 3840 E. Outer Dr., Detroit 34, Mich.
Orbon Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Sundstrand Mach. Tool Co., 2531 11th St., Rockford, III.

BALL-MAKING MACHINES

Haynes Stellite Co., Kokomo, Ind. New Departure Div., Bristol, Conn.

BAR MACHINES-See Screw Machines, Single- and Multiple-Spindle, Auto-

BAR STOCK, Non-ferrous

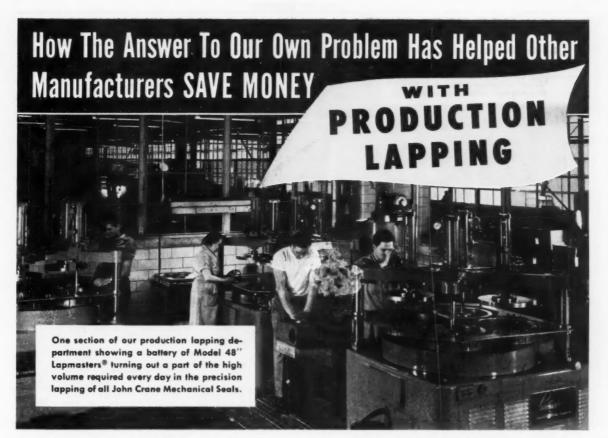
American Crucible Prod. Co., Port Huron, Mich. Mich.
Bunting Brass & Bronze Co., 715 Spencer,
Toledo, Ohio.
Centrifugally Cast Products Div., Shenango
Furnace Co., Dover, Ohio.
Mueller Brass Co., Port Huron, Mich.
Ryerson, Jos. T.I. & Son, 2558 W. 16th St.,
Chicago 18, Ill.

BAR STOCK AND SHAFTING, Steel

Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.
Boston Gear Works, 14 Hayward St., Quincy 71, Mass.
Carpenter Steel Co., 105 W. Bern St., Reading, Pa.
Carpella Steel Co., 105 W. Bern St., Reading, Pa. Pa.
Crucible Steel Co. of America, Henry W.
Oliver Bldg., Mellon Sq., Pittsburgh 22, Pa.
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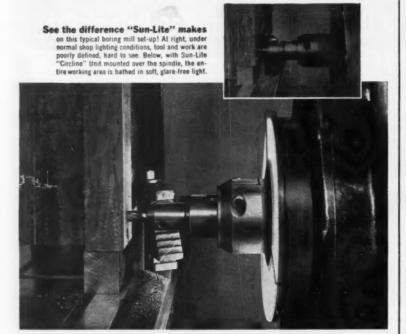








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Quincy, Mass.
Fathir Bearing Co., New Britain, Conn.
Federal Bearings Co., Inc., Poughkeepsie,
New York
Marlin-Rockwell Corp., 402 Chandler Bldg.,
Jamestown, N. Y.
New Departure Div., Bristol, Conn.
Nice Ball Bearing Co., 30th & Hunting Park
Ave., Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford,
Conn.

BEARINGS, Bronze and Special Alloy

BEARINGS, Bronze and Special Alloy
American Crucible Products Co., 1395 Oberlin
Ave., Lorain, Ohio.
Boston Gear Works, 3200 Main St., North
Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.
Shenango-Penn Mold Co., Dover, Ohio.

BEARINGS, Needle

Orange Roller Bearing Co., Inc., Orange, N. J.

BEARINGS, Oilless

American Crucible Prod. Co., Lorgin, Ohio. Bunting Brass & Bronze Co., 715 Spencer, Toledo I, Ohio. Ryerson, Jos. T., & Son, 2558 W. 16th St., Chicago 18, III.

BEARINGS, Roller

Ball & Roller Bearing Co., Danbury, Conn. Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y., Norma-Hoffman Bearings Corp., Stamford, Jamesson,
Norma-Hoffman Bearings Corp.,
Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearings Co., inc., 541 Seymour St.,
Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS, Thrust

BEARINGS, Threst
Ball & Roller Bearing Co., Danbury, Conn.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Chio.
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectody, N. Y.
Marlin-Rockwell Corp., 402 Chandler Bldg.,
Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia,
Pa.
Norma-Hoffman Bearings Corp., Stamford,
Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearing Co., Inc., Syracuse, N. Y.
Shenango-Penn Mold Co., Dover, Ohio.
Timken Roller Bearing Co., Conton, Ohio.

BELT SANDERS—See Grinding Machines, **Abrasive Belt**

BELTING, Transmission

Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

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Sundstrand Mch. Tool Co., 2531—11th St.,
Rockford, III.

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Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.

Bethlehem Steel Co., Bethlehem, Pa.

Buffalo Forge Co., 490 Broadway, Buffalo,
N. Y.

Chambersburg Engrg, Co., Chambersburg, Pa.

Elmes Eng. Div., Paddock Rd. & Tennessee
Ave., Cincinnati, Oho

Forquhar, A. B., Div. Oliver Corp., York, Pa.

Hannifin Corp., 501 Wolf Rd., Des Plaines,
Ill. Hydraulic Press Mfg. Co., Mount Gilead, Ohio. Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Niagara Machine & Tool Works, 683 North-land Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Ken-wood Ave., Chicago, III.
Watson-Stillman Co., Roselle, N. J.

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Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. N. T. Forguhar, A. B., Div. Oliver Corp., York, Pa. Wallace Supplies Mfg. Co., 1308 Diversey Parkway, Chicago 14, Ill., Watson-Stillman Co., Roselle, N. J.

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Ottemiller, W. H., & Co., York, Pa.
Parker-Kalon Div., Clifton, N. J.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Standard Pressed Steel Co., Jenkintown, Pa. Williams & Co., J. H., 400 Vulcan St., Buffalo 7, N. Y.

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Industrial Press, 93 Worth St., New York 13, N. Y.

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Ingersoll Milling Machine Co., 2442 Douglas St., Rockford, III.

Loveloy Tool Co., Inc., Springfield, Vt.

Metallurgical Products Dept of General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.

Scully-Jones & Co., 1906 Rockwell St., Chicago 8, III. 8, 111.
Universal Engineering Co., Frankenmuth 2, Mich.
Van Norman Mch. Co., 3640 Main St., Springfield 7, Mass.
Varner & Swasey, 5701 Carnegle Ave., Cleveland 3, Chio.
Vesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

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Consolidated Mch. Tool Div., 565 Blossom Rd.,
Rochester 10, N.,
Cosa Corp., 405 Lexington Ave., New York 17
Espen-Lucas Machine Works, Front St. and
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Gray, G. A., Co., 3611 Woodburn Ave., Cincinnati 7, Ohio.
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Lucas Mch. Tool Div., New Britain Mch. Co.,
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Consolidated Mch., Tool Div., 565 Blossom Rd., Rochester 10, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
G. L. and Hypro Div., Giddings & Lewis Machine Tool Co., Fond du Loc, Wis.
Kaukauna Machine & Foundry Div., Giddings & Lewis Machine Tool Co., Kaukauna, Wis.
King Machine Tool Div., Cincinnati, Ohio
New Britain Mch. Co., New Britain, Conn.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Portage Mch. Co., 1025 Sweitzer Ave., Akron 11, Ohio.
Smyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

BORING TOOLS

BORING TOOLS

American Schiess Corp.. 1232 Penn Ave., Pittsburgh 22, Pa. Apex Tool & Cutter Co., Inc., 235 Canal St., Shelton, Conn.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co. 286 Canfield Ave., Bridgeport 6, Conn.

Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Sq., Pittsburgh 22, Pa. Davis Boring Tool Div., Glddings & Lewis Machine Tool Co., Fond du Lac, Wis.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

King Machine Tool Div., Cincinnati, Ohio Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.

Portage Machine Co., 1025 Sweitzer Ave., Akron 11, Ohio.

Pratt & Whitney Co., Inc., West Hartford, Conn.

Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill.

Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich., Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

BRAKES, Press and Bending

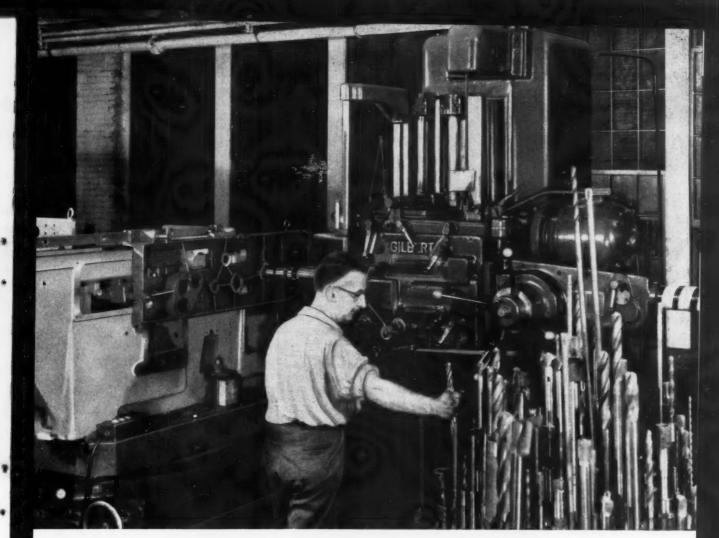
BRAKES, Press and Bending
3ath, Cyril Co., 32324 Aurora Road, Solon,
Ohio.
Cincinnati Shaper Co., Hopple & Gerrard,
Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Dreis & Krump Mfg. Co., 7400 Loomis Blvd.,
Chicago 36, III.
Ferracurbe Machine Co., Bridgeton, N. J.
Lodge & Shipley Co., Hamilton 1, Ohio.
Niogara Mch. & Tool Wks., 637 Northland
Ave., Buffalo 11, N. Y.
Verson Allsteel Press Co., 93rd St. and S.
Kenwood Ave., Chicago, III.
Watson-Stillman Co., Roselle, N. J.

BRASS

American Brass Co., 25 Broadway, New York, N. Y. Bridgeport Brass Co., Bridgeport, Conn. Mueller Brass Co., Port Huron 35, Mich. Revere Copper & Brass, Inc., 230 Park Ave., New York, N. Y.

BROACHES

American Broach & Mch. Co., Ann Arbor, Mich.
Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Detroit Broach Co., Inc., 950 S. Rochester Rd., Rochester, Mich.
duMont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Laointe Mch. Tl. Co., Tower St., Hudson, Mass.
Metallurgical Products Dept. of General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Naturnal Broach & Mch. Co., 5600 St. Jean Ave., Detroit 24, Mich.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J..
Sundstrand Mch. Tool Co., 2531—11th St., Rockford, Ill.
Threadwell Tap & Die Co., 16 Arch 3t., Greenfield, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndole, Mich. BROACHES



courtesy Brown & Sharpe Mfg. Co.

Brown & Sharpe cuts time 75% with Gilbert boring mill

"The handling time on this job has been reduced by 75% and the machining time has been reduced by 40%," says T. R. Buckles, Equipment Engineer for Brown & Sharpe Mfg. Co.

These profitable savings were earned by fitting a Cincinnati Gilbert boring mill with a Gilbert revolving table, adjustable on runway, and traveling tool holder designed by Brown & Sharpe.

There are about 180 holes in the workpiece. The boring mill performs drilling, reaming, tapping, or

boring operations as well as some milling cuts. The job was formerly done on a radial drill, portable drill, and floor type miller.

This is another typical example of the time saved (and profits earned) by Cincinnati Gilbert horizontal boring mills. Our man will be glad to show you more examples.

The Cincinnati Gilbert Machine Tool Co. 3346 Beekman Street, Cincinnati 23, Ohio

Low-cost financing plan-8% simple interest (41/4% add on), up to 5 years to pay-makes your purchase of Gilbert equipment immediately feasible.

those who buy Gilbert buy GILBERT again

Tough, hard ceramic coatings provide superior bearing surfaces

Sprayed alumina forms "sapphire-hard" surfaces highly resistant to wear, abrasion and corrosion. Ideal for bearing surfaces, seals.

Development of the new METCO THERMOSPRAY GUN for spraying highmelting-point ceramic materials at low cost opens up a variety of new practical applications. One that has produced a great deal of interest is the use of sprayed alumina coatings for bearing surfaces and mechanical seals. This THERMOSPRAY 101 Ceramic Powder produces surfaces with a hardness of 9.0 on the Moh scale, (only the diamond rates 10.0) with excellent resistance to wear, abrasion and corrosion. When used in combination with special phenolic or furane plastic sealers it provides superior protection against many acids.

Another THERMOSPRAY Powder - 201 is zirconia which is somewhat softer than No. 101 but provides superior heatinsulating properties. Melting point of this material is 4600° F. and particle hardness 8.0 on the Moh scale.

Hard-facing alloys of the self-fluxing, nickel-boron-silicon type in powder form can also be applied with the METCO Type P THERMOSPRAY GUN. These coatings may be fused, semi-fused, or left unfused depending on the hardness desired, from RC 30 to RC 65, depending on the alloy and the process used.

The new THERMOSPRAY GUN operates without compressed air, only oxygen and acetylene being required. The freeflowing THERMOSPRAY powders are fed to the flame nozzle from a hopper atop the gun, melted and propelled to the surface to be coated. These materials are sprayed many times faster (up to 15 sq. ft. per hour -. 010" thick) than has been possible with equipment previously available. Deposit efficiencies are in excess of 95%. These factors result in extremely low coating costs.

Preliminary engineering data contained in Bulletin 127 covers ceramic coatings while Bulletin 126 covers the hard-facing alloys. Either or both may be obtained by filling out the coupon below or writing on your company's letterhead. No obligation, of course,

BROACHING MACHINE, Internal

BRUACHING MACHINE, Internal
American Broach & Mch. Co., Ann Arbor,
Mich.
Colonial Broach & Machine Co., P. O. Box 37,
Harper Sta., Detroit 13, Mich.
Detroit Broach Co., Rochester, Mich.
Lapointe Mch. Ti. Co., Tower St., Hudson,
Mass.
Sundstrand Mch. Tool Co., 2531—11th St.,
Rockford, Ill.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

BROACHING MACHINE, Surface

American Broach & Mch. Co., Ann Arbor, Mich. Cincinnati Milling and Grinding Mchs., Inc., Cincinnati, Ohio.
Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Detroit Broach Co., Rochester, Mich.
Foote-Burt Co., 13000 St. Clair Ave., Cleveland 8, Ohio.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
Sundstrand Mch.

Mass.
Sundstrand Mch. Tool Co., 2531—11th St.,
Rockford, III.

BRONZE

American Brass Co., Waterbury 20, Conn. Bridgeport Brass Co., Bridgeport, Conn. Mueller Brass Co., Port Huron 35, Mich.

BRUSHES, Industrial, Tampico, Wire Wheel, Etc.

Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa. Osborn Mfg. Co., 5401 Hamilton Ave., Cleve-land, Ohio.

RUFFERS

Delta Power Tool Div., 400 Lexington Ave., Pittsburgh 8, Po. Pittsburgh Plate Glass Co., Brush Div., Balti-more 29, Md. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

BULLDOZERS, Metalforming

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. Elmes Eng. Div., Paddock Rd. & Tennessee Ave. Cincinnati, Ohio Erie Foundry Co., Erie, Pa. Forguhar Div., A. B.. 142 N. Duke St., York, Pa. Pa. Erie Engineering Corp., 470 Woodward Ave., Buffalo 17, N. Y. Watson-Stillman Co., Roselle, N. J.

BURNISHING MACHINES

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio. Russell, Holbrook & Henderson, Inc., 292 Madi-son Ave., New York 17, N. Y.

BURRING MACHINES-See Deburring

BURRS-See Files and Burrs, Rotary

BUSHINGS, Drill Jig

Donley Products, Inc., 1106 Avon Ave., Cleveland 5, Ohio Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32 Mic. 32, Mich.

Metal Carbides Corp., 6001 Southern Blvd.,
Youngstown 12, Ohio.
Universal Engrg. Co., Frankenmuth, Mich.

BUSHINGS, Hardened Steel

Brown & Sharpe Mfg. Co., Providence, R. I. Universal Engrg. Co., Frankenmuth, Mich.

BUSHINGS, Non-ferrous and Powdered Metal

American Crucible Products Co., Lorain, Ohio. Bunting Brass & Bronze Co., 715 Spencer, Toledo, Ohio. Universal Engrg. Co., Frankenmuth, Mich.

Pump rod sprayed with alumina provides superior protection against abrasion and corrosion.



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(See last paragraph above)

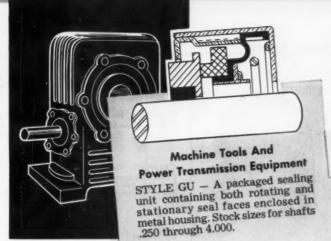
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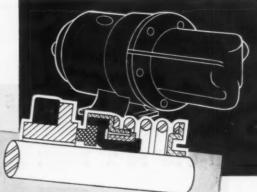


Metallizing Engineering Co., Inc. 1131 Prospect Ave., Westbury, L. I., New York

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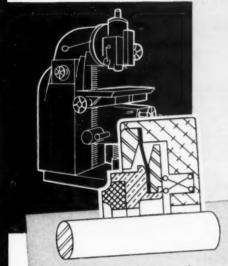
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Pumps And Compressors

ROTO-FLEX — Rugged flexibility. Only 3 parts. Single or double units. Stock sizes for shafts .250 through 4.000. STYLE RFO — A specially designed Roto-flex seal, for installation outside the stuffing box. Stock sizes for shafts .250 through 4.000.



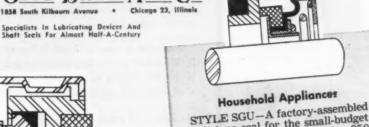
Heavy Machine Tools

STYLE DPC - A high-speed, carbon-faced seal, for more compact installation in heavy industrial machinery. Stock sizes for shafts .250 through 4.000.



These modern, mechanical, face-type seals are carried in stock to save you time and money. Write for detailed data.

GITS BROS. MFG. CO.



Aircraft Engines And Accessories

STYLE HH - Absolute minimal space (both radial and axial) under extreme conditions of temperature, pressure and seal face surface speed. Features pressure balance when fluid pressure is applied internally or externally. Stock sizes for shafts .250 through 4.000.



unit-type seal for the small-budget user. Stock sizes for shafts .250



through 1.000.



Convenience and Adaptability Have Made Lufkin the First Choice in Radius Gages



1. Determines radius of inside corner and if sides are 90°.



2. Determines radius of outside corner and if sides are 90°.



3. Determines convex radius near projection that prevents use of gage as in views 2 and 5.



Checks any concave radius that is 1/2 or less of circle.



5. Checks 1/2 of a circum-

This style radius gage, preferred by toolmakers, diemakers, patternmakers, inspectors, layout men and others, is now available in a complete range of sizes up to 2".

With a design pioneered and developed by Lufkin, each gage is a separate unit with five different gaging applications for use on both concave and convex radii. The gaging surfaces have smooth, accurately machined edges, and the sides of the blade have a polished, natural metal finish

Available in sets as listed below or by individual gage. Sets are packaged in durable folding cases of heavy red vinyl, fitted with pockets for each edge.

16 gages 1/32 to 17/64 by 64ths No. 77AX 17 gages 1/64 to 17/64 by 64ths and No. 20 Holder

No. 778 8 gages 1/32 to 1/2 by 32nds No. 77C 24 gages (Sets 77A and 77B Combined)

No. 77CX 25 gages (Sets 77AX and 77B Combined)

16 gages 1/32 to 1/2 by 32nds No. 77D No. 77E 8 gages Vis to 1 by 16ths

No. 77F 8 gages 11/s to 2 by 8ths No. 77G 16 gages 11/16 to 2 by 16ths

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TAPES . RULES . PRECISION TOOLS

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CABINETS, Tool

Brown & Sharpe Mfg. Co., Providence, R. I. Standard Pressed Steel Co., Jenkintown, Pa.

CALIPERS, Spring, Firm-Joint, Transfer, Termaphrodite, etc.—See Layout and Drafting Tools; Machinists' Small Tools

CALIPERS, Vernier

Brown & Sharpe Mfg. Co., Providence, R. I. DoAll Co., Des Plaines, III. Scherr, George, Co., Inc., 200 Lafayette St., New York 12 N. Y. Starrett, The L. S. Co., Athol, Mass.

CAM CUTTING MACHINES

Cincinnati Milling and Grinding Mchs., Inc., Cincinnati 9, Ohio.
Orbon, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Pratr & Writney Co., Inc., West Hartford, Conn.
Russell Holbrook & Henderson, Inc., 292
Madison Ave., New York 17, N. Y.
Sundstrand Mch. Tool Co., 2531—11th St., Rockford, Ill.
Van Norman Mch. Co., 3640 Main St., Springfield 7, Mass.

CAM MILLING AND GRINDING MACHINES

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Baird Machine Co., 1700 Stratford Ave., Strat-ford, Conn.
Cincinnati Milling Machine Co., Oakley, Cin-cinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.
Rowbottom Machine Co., Waterbury, Conn.

CAMS

Brown & Sharpe Mfg. Co., Providence, R. I. Eisler Engrg. Co., Inc., 750 S. 13th, Newark 3, N. J. N. J. Hartford Special Machinery Co., 287 Home-stead St., Hartford, Conn. Rowbottom Machine Co., Waterbury, Conn.

CARBIDES

CARBIDES

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Besley-Wells Corp., 112 Dearborn Ave., South Beloit, Ill.
Chicago-Latrobe Twist Drill Wks., 411 W. Ontario St., Chicago 10, Ill.
Contario St., Chicago 10, Ill.
Kennametal, Inc., Latrobe, Pa.
Linde Alir Products Co., 30 E. 42nd St., New York 17, N. Y.
Metal Carbides Corp., Youngstown, Ohio.
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CASTINGS, Die

American Brass Co., Waterbury 20, Conn. Madison-Kipp Corp., Madison, Wis.

CASTINGS, Non-ferrous

American Crucible Products Co., Lorain, Ohio. Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa. Centrifugally Cast Products Div.—5henango Furnace Co., Denver, Ohio. Dow Chemical Co., Midland, Mich. Mueller Brass Co., Port Huron 35, Mich. Vascoloy-Ramet Corp. North Chicago, III.

CASTINGS, Gray Iron, Maileable

Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.
Centrifugally Cast Products Div.—Shenango Furnace Co., Dover, Ohio.
Challenge Michry. Co., Grand Haven, Mich. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Ohio.

Kaukauna Machine & Foundry Div., Giddia, & Lewis Machine Tool Co., Kaukauna, Wis.

Sundstrand Mch. Tool Co., 2531 11th \$t., Rockford, III.



KENNAMATIC TOOL

incorporates Kendex* Chip control features

- · provides uniform chip control
- eliminates chipbreaker grinding
- · allows you to use up short inserts

This new tool utilizes the simple, effective and economical Kendex chip control system while retaining the best of the time-tested Kennamatic tool features.

It has the Kendex top structure with its clamped Kennametal* chipbreaker plate. This provides uniform chip control over a wide range of feeds and depths of cut. It also eliminates costly grinding of chipbreakers.

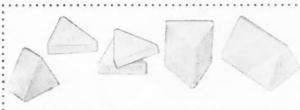
A milled shoulder or ledge on the top of the holder is located adjacent to the cutting edge. This serves as a "height gage" for accurate and fast relocation of the insert cutting point on center line of workpiece. Machine downtime for insert changing is thus held to a minimum.

The broached insert pocket and back-up screw, which has a $\frac{3}{4}$ " adjustment, makes it possible to use any combination of inserts to form a total insert length ranging from $\frac{3}{4}$ "

to $1\frac{1}{2}$ ". Short inserts may be stacked or combined with Kendex inserts. This permits use of more of the original insert, and simplifies insert inventories if you are converting from long inserts to "throw-aways."

Style "K" Kennamatic tool holders are available from stock in 7 styles and a wide range of shank sizes, plus a full complement of Kennamatic inserts, for a wide variety of machining operations.

Your Kennametal tool engineer will gladly demonstrate the new Kennamatic Tool. Call him or write to Kennametal Inc., Latrobe, Pa.



Style "K" Kennamatic tool holders permit use of short inserts with Kendex inserts to build up insert lengths ranging from \(\frac{1}{2} \)".

*Trademarks



KENNAMETAL
...Partners in Progress

For more information fill in page number on Inquiry Card, on page 255

MACHINERY, April, 1957-311



BUSHINGS, BEARINGS, BARS AND SPECIAL PARTS OF CAST BRONZE AND

The Bunting Brass and Bronze Company . Toledo 1, Ohio . Branches in Principal Cities

CASTINGS, Steel, Stainless, etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa. Birdsboro Steel Fdry, & Mch. Co., Birdsboro, Pa. Crucible Steel Co., of America, Henry W. Oliver Bldg., Pittsburgh 22, Pa.

CEMENT, Abrasive Disc

Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa. Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

CENTER-DRILLING MACHINES

Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio
Hartford Special Machinery Co., 287 Homestead St., Hartford, Conn.
La Salle Tool Inc., 3840 E. Outer Dr., Detroit
34, Mich.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, III.

CENTER PUNCHES — See Machinists' Small Tools

CENTERS, Grinding Machines, Indexing Head and Lathe

Head and Lathe
Brown & Sharpe Mfg. Co., Providence, R. i. Buck Tool Co., 220 Schippers Lane, Kalamozoo, Mich.
Donley Products, Inc., 1106 Avon Ave., Cleveland 5, Ohio
Metal Carbides Corp., Youngstown, Ohio
Metallargical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit, Mich.
Scully Jones & Co., 1906 Rockwell St., Chicago 8, Ill.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

CERAMIC TOOL MATERIAL-See Tool Material, Ceramic

CHAINS, Power Transmission and Conveyor

Boston Gear Works, 14 Hayward St., Quincy 71, Mass.

CHUCKING MACHINES, Single-Spindle Automatic

Bullard Co., 286 Canfield Ave., Bridgeport 6, Conn.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio
Coulter, James Mch. Co., 629 Railroad Ave., Bridgeport 5, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Maclison 10, Wis.
Jones & Lamson Mch Co., Springfield, Vt. National Acme Co., 170 E. 131st St., Cleveland, Ohio
Potter and Johnson Co., 1027 Newport Ave., Pawtucket, R. I.
Russell Holbrook & Henderson, Inc., 292
Madison Ave., New York 17, N. Y.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 83, Ohio Bullard Co., 286 Canfield Ave., Bridgeport 6,

CHUCKING MACHINES, Multiple-Spindle Automatic

Automatic

Baird Machine Co., 1700 Stratford Ave.,
Stratford, Conn.

Bullard Co., 286 Canfield Ave., Bridgeport 6,
Conn.

Burg Tool Mfg. Co. Inc., Gardena, Calif.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cross Co., 3250 Bellevue Ave., Detroit 7,
Mich.
Goss & DeLeeuw Mch. Co., Kensington, Conn.
National Acme Co., 170 E. 131st St., Cleveland, Ohio
New Britain Mch. Co., New Britain-Gridley
Mch. Div., New Britain, Conn.
Olofsson Corp., 2729 Lyons Ave., Lansing,
Mich.

(Continued on page 314)



For more information fill in page number on Inquiry Card, on page 255

MACHINERY, April, 1957-313



When a manufacturer is faced with cost increases, the easy thing to do is to pass the increase on to the customer. We're faced with this temptation just like everyone else. In the past 20 years, our wage rates have risen to over three times their old level; the composite price of steel has risen to about 21/2 times the old price; taxes, shipping, equipment costs have all multiplied similarly. But just as we are under this pressure to raise our prices accordingly, we are also under pressure from you the customer to keep the price of our product within reason. There is only one way out of this dilemma for us - to improve our efficiency. And that is what we are constantly doing - with new, more efficient machines and equipment, and improved production facilities. Machinery and methods of even a few years ago are inadequate by today's standards of competition. For this reason, if you've traditionally been making your own gears, or obtaining them from a small shop in the neighborhood, we suggest you consult your nearest Cincinnati Gear representative to see how our ultra-modern set-up compares today - and find out what we can do for you in the three important categories of quality, service, and price on your custom gear needs.

THE CINCINNATI GEAR CO. CINCINNATI 27, OHIO

Fifty Years of "Gears - Good Gears Only"



Pratt & Whitney Co., Inc., West Hartford, Conn. Warner & Swasey, 5701 Carnegie Ave., Cleve-land 3, Ohio Wickes Brothers, 512 No. Water St., Saginaw, Mich.

CHUCKS, Air Operated

CHUCKS, Air Operated

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles SB, Cal.

Buck Tool Co., 220 Schippers Lane, Kalamazoo, Mich.

Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

Logansport Machine Co., Inc., 810 Center Ave., Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.

Schraders Son, A., 470 Vanderbilt Avenue, Bracklyn, N. Y.

Skinner Chuck Co., 95 Edgewood Ave., New Britaln, Conn.

Zagar, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio

CHUCKS, Collet

CHUCKS, Cellet
Brown & Sharpe Mfg. Co., Providence, R. I.
Bryant Chucking Grinder Co., Clinton St.,
Springfield, Vt.
Chicago Tool & Engrg. Co., 8389 So. Chlcago
Ave., Chicago, III.
Claveland Automatic Machine Co., 4932
Beech St., Cincinnati 12, Ohio
Cushman Chuck Co., 800 Windsor St., Hartford 2, Conn.
Delta Power Tool Div., 400 N. Lexington Ave.,
Pittsburgh & Pa.
Errington Mech. Lab. Inc., 24 Norwood Ave.,
Staten Island 4, N. Y.
Gisholt Mch. Co. 1245 E. Washington Ave.,
Madison 10, Wis.
Gorton Mch. Co., Geo., 1321 Racine St.,
Racine, Wis.
Hardinge Bros., Inc., 1420 College Ave.,
Elmira, N. Y.
Elmira, N. Y.
Elmira, N. Y.
Elmira, Co., West Hartford 10, Conn. Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
Jocobs Mfg. Co., West Hartford 10, Conn. Kearney & Trecker Corp., Milwaukee 14, Wis. National Acme Co., 170 E. 131st St., Cleveland 8, Ohio
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind., Universal Engrg. Co., Frankenmuth 2, Mich. Warner & Swasey, 5701 Carnegle Ave., Cleveland 3, Ohio

CHUCKS, Combination Universal-Independent

pendent
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.,
Gisholt Mch. Co., Madison 10, Wis.,
Horton Chuck, Windsor Locks, Conn.,
Kearney & Trecker Corp., Milwaukee 14, Wis.,
National Acme Co., 170 E. 131st St., Cleveland 8, Ohio
Skinner Chuck Co., 95 Edgwood Ave., New
Britain, Conn.

CHUCKS, Compensating

Burg Tool Mfg. Co. Inc., Gardena, Calif. Cushman Chuck Co., 806 Windsor St., Hart-ford 2, Conn. Logansport Mch. Co., Inc., Logansport, Ind. Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

CHUCKS, Diaphragm

Bryant Chucking Grinder Co., Clinton St., Springfield, Vt. Wadell Equip. Co., Terminal Ave., Clark, N. J.

CHUCKS, Drill, Key Type

Delta Power Tool Div., 400 Lexington Ave., Pittsburgh 8, Pa. Jacobs Mfg. Co., West Hartford, Conn.

CHUCKS, Drill, Keyless

Delta Power Tool Div., 400 Lexington Ave., Pittsburgh 8, Pa. Jacobs Mfg. Co., West Hartford, Conn. Scully-Jones & Co., 1906 Rockwell 3t., Chicage 8, III.

CHUCKS, Full Floating

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y. Gisholt Mch. Co., Madison 10, Wis. Scully-Jones & Co., 1903 Rockwell St., Chi-cago 8, III. Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Gear

Bryant Chucking Grinder Co., Clinton St., Springfield, Vt.
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Horton Chuck, Windsor Locks, Conn.

CHUCKS, Independent

Cushman Chuck Co., 806 Windsor St., Hart-ford 2, Conn.
Gisholt Mch. Co., Madison 10, Wis.
Homestrand, Inc., Larchmont, N. Y.
Horton Chuck, Windsor Locks, Conn.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

CHUCKS, Lathes, etc.

CHUCKS, Lethes, etc.

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.

Buck Tool Co., 220 Schippers Lane, Kalamazoo, Mich.

Bullard Co., Brewster St., Bridgeport 2, Conn.

Chicogo Tool & Eng. Co., 839 So. Chicogo Ave., Chicago, Illinois (Milling Machine)

Cushmon Chuck Co., Windsor Ave., Hartford 2, Conn.

Gisholt Mch. Co., Madison 10, Wis.

Horton Chuck, Windsor Locks, Conn.

Jacobs Mfg. Co., West Hartford, Conn.

Jacobs Mfg. Co., West Hartford, Conn.

Jones & Lamson Mch. Co., Springfield, Vt.

Scherr, George, Co., Inc., 200 Lafayette St.,

New York 12, N.

Seritain, Conn.

Britain, Conn.

Britain, Conn.

Both Bend, Ind.

Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

Worner & Swarey Co., 5781 Carregie Ave. St., South Bend, Ind. Standard Tool Co., 3950 Chester Ave., Cleve-land, Ohio. Warner & Swasey Co., 5701 Carnegle Ave., Cleveland 3, Ohio. Zagar, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio

CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAII Co., 254 Laurel Ave., Des Plaines, III.
Hanchert Magna-Lock Corp., Big Rapids, Mich.
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Scully-Jones & Co., 1906 Rockwell St., Chicago
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CHUCKS, Tapping

DoAll Co., 254 N. Laurel Ave., Des Plaines, III.

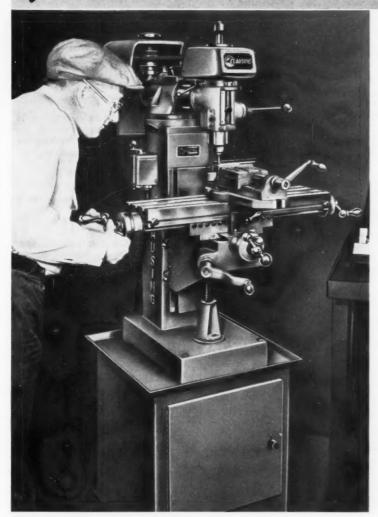
Errington Mechanical Laboratory 24 Norwood

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314—MACHINERY, April, 1957

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- Spindle taper (internal) run out within .0002" at spindle nose.
- Table T-slots parallel to table dovetail ways within .0005" in 8" longitudinal travel.

CONDENSED SPECIFICATIONS

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Longitudinal Table Travel	1000	.1	5	**
Transverse Table Travel			5	re
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Maximum Distance Spindle to Column	. 8	13/	4	ee
Quill Travel			3	re

The spindle head can be swiveled in a vertical plane and set at any angle, and turret rotated in a horizontal plane making it possible to mill, drill, bore, ream and shape at all angles with one set-up. Quill has micrometer depth control stop and two feeds, lever and hand wheel.

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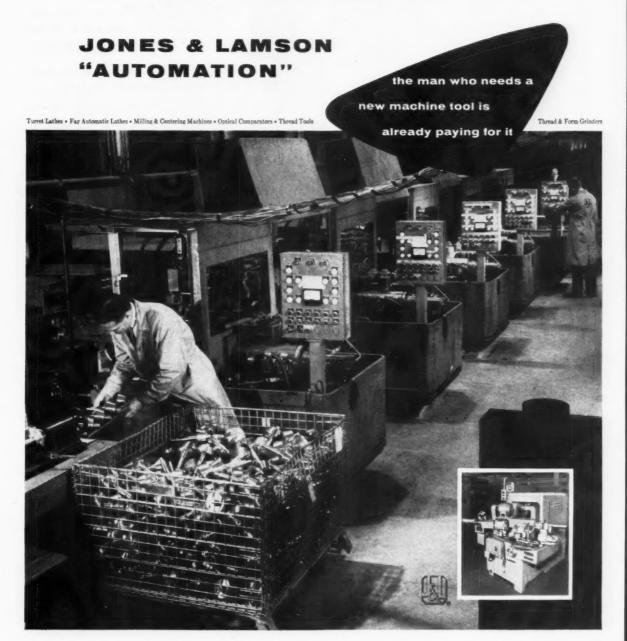
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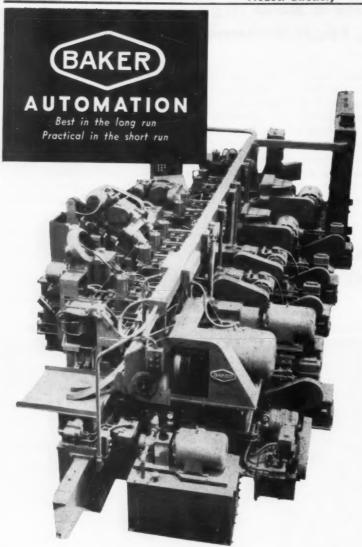
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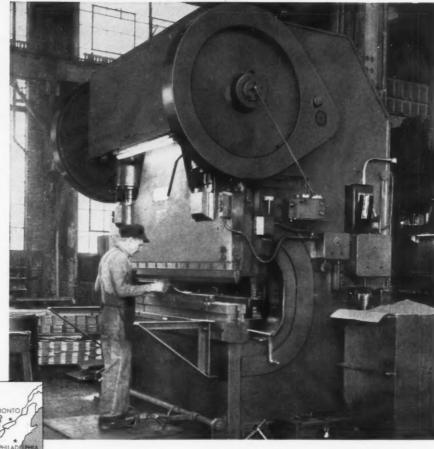
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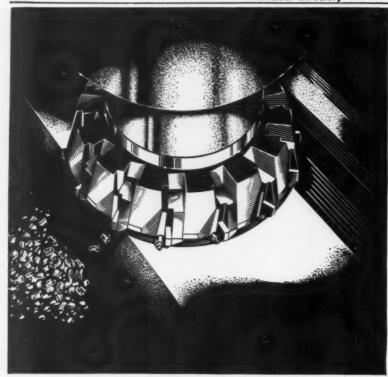
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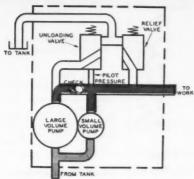


Fig. 1 Combined Delivery of Large and Small Volume Cartridges at Low Pressure

TO TANK

UNLOADING

VALVE

VAL

Fig. 2 Delivering Small Volume at High Pressure

Two Vickers Vane Type pumping cartridges are mounted on the same shaft—in the same housing, driven by the same prime mover. One provides a large volume of oil while the other delivers a small volume. These Vickers Two-Pressure Pumps have proved advantageous in a wide variety of applications.

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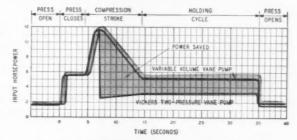


Fig. 3. On this typical press application the saving in power is approximately 50% with a resultant saving in heat in the system.

Like all Vickers Vane Pumps, these two-pressure pumps have the hydraulic balance feature that relieves bearings of all pressure loads (one of the major causes of wear). Cartridge construction enables customer to service in his own plant instead of returning to factory should repairs be necessary. Relief and unloading valves are integral . . . minimizing piping and connections. Complete range of sizes up to 48 gpm. For additional information, ask for Bulletin 54-70a.

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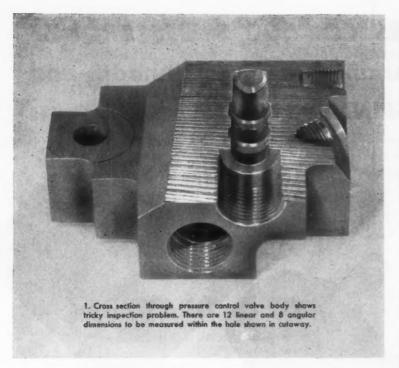
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(Continued on page 326)





2/3 cut in gaging time

helped prove how 23 more Kodak Contour Projectors would return their cost inside 12 months

A leading manufacturer of aircraft components recently purchased 23 Kodak Contour Projectors when cost studies showed the machines would pay for themselves in 12 months.

The studies were based on the time and labor saved by Kodak Contour Projectors in inspection of parts like the pressure control valve body pictured above.

This component has 12 linear and 8 angular dimensions to be checked—all inside a blind hole. With a Kodak Contour Projector, Model 30, inspection of 25 pieces takes just 3½ hours. Formerly, the same job took 10 hours

and was less accurate. Hundreds of manufacturers across the country have had similar experiences with all sorts of complex parts, large and small.

Whether your problem involves receiving, production, or final inspection, there's a Kodak Contour Projector to do the job quickly, accurately, and at low cost. To learn more about how optical gaging can work for you, send for your copy of the free booklet "Projection Gaging with Kodak Contour Projectors," or write for the name of the representative in your area. No obligation, of course.

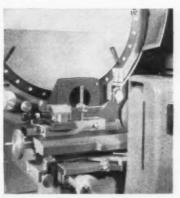


the KODAK CONTOUR PROJECTOR

For more information fill in page number on Inquiry Card, on page 255



2. Part of the receiving inspection department of the aircraft components plant. Model 30 Contour Projector is at the left. Operators work comfortably in normal lighting.



 Close-up of Model 30 shows tracer fixture and pantagraph. The tracer fixture follows the contours of the hole and translates them into an image on the screen for accurate gaging.



4. In another application, a Kodak Contour Projector, Model 4, is used with a jeweler's lathe, which enables the operator to grind the radii on a servo mechanism piston to a tolerance of .0005" by watching the magnified image during grinding.



MACHINERY, April, 1957-323

MUELLER BRASS CO. 600 SERIES BRONZE the main working part in the smooth and





324-MACHINERY, April, 1957

FORGED GEAR powerful



The Montague-Ocean City Rod & Reel Co. of Philadelphia is proud of the fact that many fishermen are calling their famous Ocean City "300" series spinning reels "the most dependable spinning reels in America." Such praise justifies the very best components in a product—like the corrosion-resistant Mueller Brass Co. "600" alloy gear. Provides its own shaft and has an integral clutch which takes the driving force from the handle, and incorporates a cam which provides the oscillating motion of the spool for cross-winding the line. Bronze was chosen because of the need for maximum strength, long wear, and because it is such an excellent bearing material. This application dramatically points up the valuable properties of Mueller "600" series alloys.

There are countless applications of Mueller "600" series bearing alloys. Find out how you can utilize one or more of then, in YOUR products. Because forgings can be made closer to the finish size in "600" series alloys than can sand castings, there is less waste, greater speed in finishing.

WRITE TODAY FOR THE ENGINEERING MANUAL YOU NEED

Mueller Brass Ce. Forgings Engineering Manual H-58565

Tuf Stuf Aluminum Bronze Alloys
Engineering Manual H-58563

600 Series Bearing Alleys Engineering Manual FM-3000

Copper Base Alleys in Red Form Engineering Manual FM-3010



METALS AND ALLOY REVIEW



by FRANK M. LEVY

Vice-President and Director of Research

Recently Ray Engelgau, who heads our statistical quality control procedures, and Amos Armitage from our machining department met in my office and we had a very interesting discussion on our new "S-C" rod. The term "S-C" is derived from the fact that it is produced from billets that are cast semi-continuously. In addition, we use the letters "S-C" to indicate its "super cutting" qualities which is one of the outstanding characteristics of this rod. We have definitely proved these qualities in some very exhaustive tests, one of which I'd like to tell you about here.

Experience has shown that it is difficult to control dimensions within close tolerances on machine parts involving internal forming operations. Amos had run into exactly that trouble with a certain hydraulic fitting made from rod that required a fairly close dimensional tolerance on the internal formed diameter. So, we decided to make a comparison test by machining the part from rod made by the conventional method and from rod produced by the S-C process. When rod made by the conventional method was machined, the parts could not be held within the specified tolerance range. The same machine, the same tooling and the same machine operator were used in this test, and when S-C process rod was substituted, the machine parts were well within the required tolerance range.

In addition, I just received a letter from a well-known equipment manufacturer who has been running tests on S-C rod. They reported that the incidence of tool trouble per 1000 forgings machined from S-C rod were approximately half that of forgings made from conventional rod. We think that is pretty good evidence that the rod made by our semi-continuous process is exceptionally uniform by all standards. Incidentally, our new billet casting department is quite a model of automation and has a number of interesting processes and features. Anytime you happen to be in our area we would be more than happy to show you through and explain the many points of this process that gives us what we firmly believe to be the best possible rod available today which of course is reflected in the quality of our forgings.

If you would like a folder that fully covers our semicontinuous process, just drop me a note and I'll see that one is sent along to you promptly. In the meantime, we'd like to have you investigate our super-cutting S-C rod because we think it will improve your product quality—and we've got the alloys to do most anything to meet the most exacting demands.

Thanks for your time.

MUELLER BRASS CO.

PORT HURON 27, MICHIGAN



MACHINERY, April, 1957-325

200000

National Automatic Taol Co., Richmond, Ind. National Twist & Tool Co., Rochester, Mich. Scully-Jones & Co., 1906 S. Rockwell St., Chi-cago 8, III.

DRILL HEADS, Multiple Spindle

Atlas Press Co., 20108 N. Pitcher, Kalamazoo,

Ohio.

Barnes Drill Co., 814 Chestnut, Rockford Ill.
Baush Machine Tool Co., 15 Watson Ave.,
Springfield, Mass.
Buffalo Forge Co., Broadway, Buffalo, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Davis & Thompson Co., 4460 N. 124th St.,
Milwaukee 10, Wis.
Delta Power Tool Div., 400 N. Lexington Ave.,
Pittsburgh, Pa.
Errington Mechanical Laboratory, 24 Norwood
Ave., Stapleton, Staten Island, N. Y.

Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn, N. Y.
Hyn, N. Y.
Hartford Special Machinery Co., 287 Home-stead St., Hartford, Conn.
Kearney & Trecker Corp., Milwaukee 14, Wis.
LaSalle Tool, Inc., 3840 E. Outer Dr., Detroit 34 Milch Salle Tool, Inc., 3840 E. Outer Dr., Detroit 34, Mich. land Gifford Co., Box 989, Worcester 1,

Leland Gifford Co., Box 989, Worcester 1, Mass.
National Automatic Tool Co., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 Lafayette, Detroit 7, Mich.
Thriffmester Products Corp., 1076 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio
Zagar, Inc., 2400 Lakeland Blvd., Cleveland 23, Ohio

DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill. Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.

Hartford Special Machinery Co., 287 Home-stead Ave., Hartford 12, Conn. Kingsbury Mch. Tool Carp., Keens, N. H., Milholland, W. K. Machinery Co., 6402 West-field Blwd., Indianopolis 5, Ind. Rehnberg-Jacobson Mfg. Co., 2135 Kiswaukee St., Rockford, III. Snow Manufacturing Co., Bellwood, Illinois

DRILLING AND BORING UNITS, Self-

Avey Drilling Machine Co., 25 East Third St., Covington, Ky. Baker Brothers, Inc., 1000 Post St., Toledo 10. Chip. Avey Drilling Machine Co., 25 East Third St., Cavington, Ky.
Baker Brathers, Inc., 1000 Post St., Toledo 10, Ohio
Bornes, W. F. & John Co., Rockford, Ill.
Baush Machine Tool Co., 15 Wason Ave., Springfield, Mass.
Buhr Machine Tool Co., 839 Green St., Ann Arbor, Mich.
Cross Co., 250 Bellevue, Detroit 7, Mich.
Ettoo Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y.
Govro-Nelson Co., 1931 Antoinette St., Detroit 8, Mich.
Hortford Special Machinery Co., 287 Homestead St., Hartford, Conn.
Homestrand, Inc., Larchmont, N. Y.
Kaukauna Machine & Foundry Div., Giddings & Lewis Machine Tool Co., Kaukauna, Wis.
Kearney & Trecker Corp., Milwaukee 14, Wis.
Leond-Giffford Co., Box 989, Warcester 1, Mass.
Milballand, W. K. Machinery Co., 6402 WestMilballand, W. K. Machinery Co., 6402 West-

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Leiand-Gifford Co., Box 989, Warcester 1, Mass.
Milholland, W. K. Machinery Co., 6402 West-field Blvd., Indianapolis 5, Ind.
Morris Machine Tool Co., Inc., 933 Harriet St., Cincinnati 3, Ohio National Automatic Tool Co., S. 7th and N. Sts., Richmond, Ind., Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y. Sheffield Corp., Box 893, Dayton 1, Ohio Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit, Mich.
Townsend, H. P., Mfg. Co., Elmwood, Conn. Western Machine Tool Works, Holland, Mich. Zagar, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio



Motor Horsepower

...... 3/4 HP-1200 RPM to 5 HP-1800 RPM

Thrust, maximum 1800 lbs. Length of stroke, maximum ... 6" Spindle Speeds ... 95 to 4000 RPM Stroke Cycle 1-1/2 seconds to

Capacity in Steel 1-1/2" Drill

6 minutes

Write for Bulletin M-4000 giving further details.

The Millholland cam feed drilling unit has a capacity of 5 HP and maximum stroke of 6". This unit employs the very efficient plate cam with pneumatic counterbalance that has been used for years in Millholland Units, The No. 4000 unit is completely enclosed and is lubricated by a micro-fog system which conveys oil from a container external to the unit to all bearing surfaces and gears.

Clutching and declutching of the feed mechanism are controlled electrically through a solenoid air valve mounted in the unit, which in turn operates an air cylinder mounted directly on the clutch. 30 P.S.I. air pressure is sufficient to provide instantaneous response of the feed clutches.

The roller-bearing cam roller is mounted in the spindle carrier and accurately translates the circular lead cut on the cam to a constant linear feed on the spindle carrier. The hardened cam is manufactured from tool steel, and spindle reduction gears are shaved.

A single tool may be used in the spindle, or a multiple head may be attached to the spindle carrier.

W. K. MILLHOLLAND MACHINERY CO. Indianapolis 20, Indiana 6402 Westfield Blvd.

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Bodine Corp., 317 Mt. Grove St., Bridgeport S., Conn.
Burg Tool Mfg. Co. Inc., Gardena, Calif.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Crosa Co., 3250 Bellevue, Detroit 7, Mich.
Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis.
Edlund Mchry. Co. Div., Cortland, N. Y.
Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y.
Hartford Special Machinery Co., 287 Homested St., Hartford, Conn.
Kearney & Trecker Corp., Milwaukee 14, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
LaSalle Tool, Inc., 3840 E. Outer Dr., Detroit 34, Mich.
Leland-Gifford Co., Box 989, Worcester 1,
Mass.

Jean-Giffford Co., Box 989, Worcester 1, Mass.
Millholland, W. K. Machinery Co., 6402 West-field Bivd., Indianapolis 5, Ind.
Modern Industrial Eng. Co., 14230 Birwood Ave., Detroit 38, Mich.
Moline Tool Co., Moline, III.
Morris Machine Tool Co., Inc., 933 Harriet Cincinnatt 3, Ohlo.
National Automatic Tool Co., Inc., \$7th and N. Sts., Richmond, Ind.
Olofsson Corp., Lansing, Mich.
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N., Y.
Snow Manufacturing Co., Bellwood, III.
Townsend, H. P., Mfg. Co., Einwood, Conn.
Wales-Strippit Corp., North Tonawanda, N. Y.
Zagar, Inc., 24000 Lakeland Bivd., Cleveland 23, Ohlo.

DRILLING MACHINES, Bench

DRILLING MACHINES, Bench
Atlas Press Co., 20108 N. Pitcher, Kalamazoo,
Mich.
Avey Drilling Mochine Co., 25 East Third St.,
Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo,
N. Y.
Burg Tool Mfg. Co. Inc., Gardena, Calif.
Cincinnati Lathe & Tool Co., Marburg Ave.,
Cincinnati 9, Ohio
Cosa Corp., 405 Lexington Ave., New York
17, N. Y.

(Continued on page 328)



For men who know drill heads best, it's always U. S. Drill Head ... 5 to 1

1957

The 50,000th Head was shipped.

Since 1915, when the U.S. Drill Head Co. built its first adjustable head, it has far surpassed all other similar manufacturers because of its engineering and production facilities.

Manufacturers of all types of adjustable, fixed center and individual lead screw tapping heads.



THE UNITED STATES DRILL HEAD COMPANY

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DRILLING MACHINES, Deep Hole

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Maris Machine Tool Co., Inc., 933 Harriet cinnott 3. Ohio
National Automatic Tool Co., Inc., S. 7th and N. St., Richmond, Ind. Pratt & Whitney Co., Inc., West Hartford, Conn. Wales-Strippit Corp., North Tonowanda, N. Y.

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Hamilton Tool Co., 834 So. 9th St., Hamilton, Ohio
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Moline Tool Co., Moline, III.
Morris Machine Tool Co., Inc., 933 Harriet St., Cincinnati 3, Ohio
National Automatic Tool Co., Inc., 57th and N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
South Bend Lathe Works, South Bend 22, Ind.
Western Machine Tool Works, Holland, Mich.

DRILLING MACHINES, Radial

DKILLING MACHINES, Radial

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Cincinnati Gilbert Machine Tool Co., 3366
Beekman St., Cincinnati 23, Ohio
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Cleveland Punch & Shear Works Co., 3917 St.
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Casa Corp., 405 Lexington Ave., New York
17, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleve-Foote-Burt Co., 1300 St. Clair Ave., Creve-land, Ohio Fosdick Mch. Tool Co., 1638 Blue Rack, Cin-cinnati 23, Ohio Hartford Special Machinery Co., 287 Home-stead St., Hartford, Conn. Morris Machine Tool Co., Inc., 933 Harriet St., Cincinnati 3, Ohio Russell Holbrook & Henderson, Inc., 292 Madi-son Ave., New York 17, N.Y. Western Machine Tool Works, Holland, Mich.

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10, Ohio
Buffalo Forge Co., 490 Broadway, Buffalo,
N. Y. Buffalo Forge Ca., 490 Broadway, Buffalo, N. Y.
Burg Tool Mfg. Co., Inc., Gardena, Calif.
Cincinnati Bickford Div., Oakley, Cincinnati, Ohio
Cincinnati Bickford Div., Oakley, Cincinnati, Ohio
Cosa Corp., 405 Lexington Ave., New York
17, N. Y.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh, Pa.
Edlund Machinery Co. Div., Cortland, N. Y.
Footte-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Footte-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Footte-Burt Co., 1638 Blue Rock St., Cincinnati 23, Ohio
Hamilton Tool Co., 1638 Blue Rock St., Cincinnati 23, Ohio
Henry & Wright Div., Hartford, Conn.
Leland-Gifford Co., Box 989, Worcester, Mass.
Levin & Son, Inc., Louis, 3610 So. Broadway, Los Angeles, Calif.
National Aufomatic Tool Co., Inc., 5. 7th and N St., Richmond, Ind.
Snow Manufacturing Co., Bellwood, Illinois
South Bend, Ind.
Townsend, H. P., Mfg. Co., Elmwood, Conn.
Wales-Strippit Corp., North Tonawanda, N. Y.
Western Machine Tool Works, Holland, Mich.

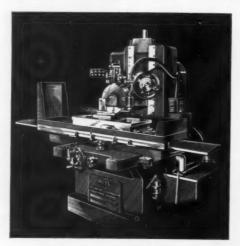
DRILLING MACHINES, Universal Radial

Kaukauna Machine & Foundry Div., Giddings & Lewis Machine Tool Co., Kaukauna, Wis.

DRILLING MACHINES, Upright

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Avey Drilling Machine Co., 25 East Third St., Covington, Ky.
Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio
Barnes, W. F. & John Co., Rockford, Ill.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. N. Y. Burg Tool Mfg. Co. Inc., Gardena, Calif. Cincinnati Bickford Div., Oakley, Cincinnati, Ohio Cincinnati 19, Ohio Cosa Corp., 405 Lexington Ave., New York, 17, N. Y. Etteo Tool Co., Inc., 594 Johnson Ave., Brook-lyn 37, N. Y.

(Continued on page 330)



Questions you should ask before you buy a SURFACE GRINDER

• Are column and base one piece for permanent vibrationless rigidity?

Are both longitudinal table travel and cross feed hydraulically actuated?

Is wheel head powered for rapid vertical travel?
Is it equipped with Vickers vane hydraulic pump?
Is longitudinal table capable of speeds to 125 fpm?

• Is it equipped with greased-for-life, pre-loaded ball bearing spindle?

Does wheel head have 18 inch vertical movement?

• Is the spindle capable of speeds of 1925 and 2500 rpm?

• Does it have a 12" x 36" table working surface? • Is it equipped with Bijur one-shot lubricating system?

You'll Choose Grand Rapids Grinder, No. 55 because it's the only grinder of its type that answers an emphatic "yes" to every one of these ten important questions.

Write for 24 page bo that tells all about it.



GALLMEYER & LIVINGSTON COMPANY

305 Straight Ave., S.W., Grand Rapids, Michigan



RELIABLE SINCE 1895

WESTERN LINE

WESTERN Heavy-Duty Upright Drill

18 Speeds—9 Feeds—12" Overhang—Permanently lubricated—Ball Bearing Equipped—Four sizes up to 2 ½" drill capacity.

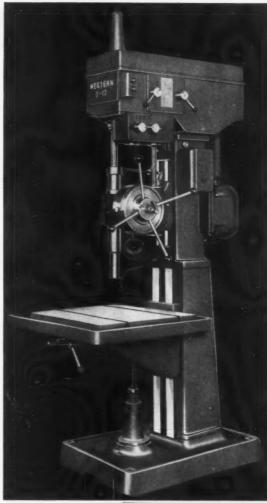


CHARD LATHES

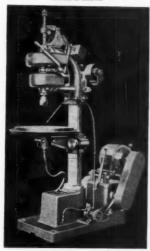
CHARD LATHES — Quick change, geared head; 16", 18" and 20" swing, 8 or 12 speeds. GARVIN AUTOMATIC TAPPERS — Up to 3" pipe tap capacity; four spindle speeds.

STEPTOE SHAPERS — 14" to 24" Heavy Duty; 12" and 15" High Speed, up to 200 strokes per minute.

WESTERN RADIAL DRILLS — Heavy Duty, 3 to 8 ft., 16 or 32 speeds. High Speed, 3 to 6 ft., 6, 12 or 18 speeds.



GARVIN AUTOMATIC TAPPERS



WESTERN HEAVY-DUTY UPRIGHT DRILLS contain 18 geared spindle speeds, nine power feeds, an extra large work table and ample power . . . all outstanding features built into this one machine. Available in single- or multiple-spindle models. All transmission shafts are multiple splined, precision ground, and have an alloy steel, involute splined spindle of heavy-duty proportions mounted on three precision ball bearings, with a No. 3 or No. 4 Morse taper nose: Speed and feed selections are made by sliding hardened steel gearing on multiple involute splined shafts. All transmission shafts are mounted on permanently lubricated ball bearings, eliminating supplementary lubrication. All of the gearing is totally enclosed and running in lubricant. Also available in high speed, infinitely variable type, single or multiple spindles. Complete accessory selection.

For more information on these and other machines in the Big 4 Line, write for catalogs. Specify capacity desired.

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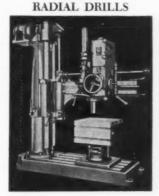
WESTERN MACHINE TOOL WORKS

HOLLAND, MICHIGAN, U.S.A.



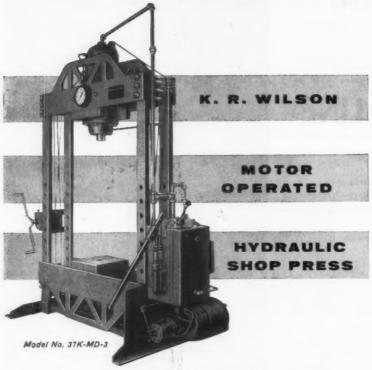


STEPTOE SHAPERS WESTERN



RUG

100 TON CAPACIT



BUILT TO HANDLE LARGER, HEAVIER **WORK AT HIGHER TONNAGES WITH EASE**



Photo above indicates the heavy construction of bed plates - reinforced to provide maximum rigidity and minimum deflection.

SPECIFICATIONS

Ram Speeds — in./min.	18
Cylinder Bore - in.	7 -
Ram Stroke — in.	12
Daylight - in./max.	421/4
Opening, L-R - in.	451/2
Between Bed Plates	111/8
Motor, H.P. 71/2/220	/440-3-60
Shipping Wt lbs.	3025

STANDARD EQUIPMENT

1 pair notched V blocks; 1 pressure gauge, dual range P.S.I. and tons on ram; 1 bed adjusting mechanism; 1 flat ram nose; 1 auxiliary 2-speed hand-pump.

You won't have to baby this husky K. R. Wilson hydraulic shop press. Built to tackle the toughest jobs, it's the most rugged standard press of its type available. Heavy-duty, spring-return ram type hydraulic cylinder has a larger bore and longer stroke. This allows the press to handle the big jobs swiftly and safely with a minimum of bed plate adjusting. You get tremendous versatility too! The large, usable daylight opening between side members allows straightening of long pieces. Pressing bushings, shafts, wheels on and off, broaching, bending, coining, forming and drawing operations all can be handled with equal speed and ease. K. R. Wilson Motor Operated Hydraulic Shop Presses are also available in 30, 50 and 75 Ton Capacity. Get all the facts now on these rugged presses!

Get Full Details. Write for Bulletin No. 19

HYDRAULICS DIVISION

K. R. WILSON, Inc.





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Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
National Automatic Tool Co., Inc., S. 7th and N. St., Richmond, Ind.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukes St., Rockford, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend Lathe Works, Inc., 425 E. Madison St., South Bend Ind.
Wales-Strippit Corp., North Tonawanda, N. Y.
Western Machine Tool Works, Holland, Mich.

DRILLS, Center

Besly-Welles Corp., 112 Dearborn Ava., Beloit, W.s.
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DoAll Co., Des Plaines, III.
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Threadwell Tap & Die Co., 16 Arch St., Green-Mich.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DRILLS, Core

DRILLS, Core

Ace Drill Corp., Adrian, Mich.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Warks, 411 W. Ontario St., Chicago III.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
DAII Co., Des Plaines, III.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Metallurglacal Products Dept. of General Electric Co., Box 237, Rossevelt Park Annex, Detroit 32, Mich.
National Twist Drill & Ti. Co., Rochester.
Mich. Notional Twist Drill & Tl. Co., Rochester, Mich.
Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill., Star Cutter Co., 34500 Grand River, Farmington, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Deep Hole, Gun

Ace Drill Corp., Adrian, Mich.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicago 10, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tl. Co., Rochester,
Alich. National Iwas D.M. Mich.
Star Cutter Co., Farmington, Mich.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DRILLS, Oil Hele, Oil Tube

Besly-Welles Corp., 112 Dearborn Ave., South
Beloit, III.

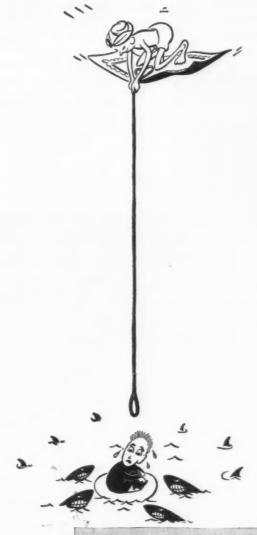
Chicogo-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicogo 10, III.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland 14, Ohio
DoAll Co., Des Plaines, III.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Ti. Co., Rochester,
Mich. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Portable Electric

Chicogo Pneumatic Teol Co., New York 17, N. Y. Ingersoil-Rand Co., 11 Broadway, New York 4, N. Y. Thor Power Tool Co., Aurora, III.

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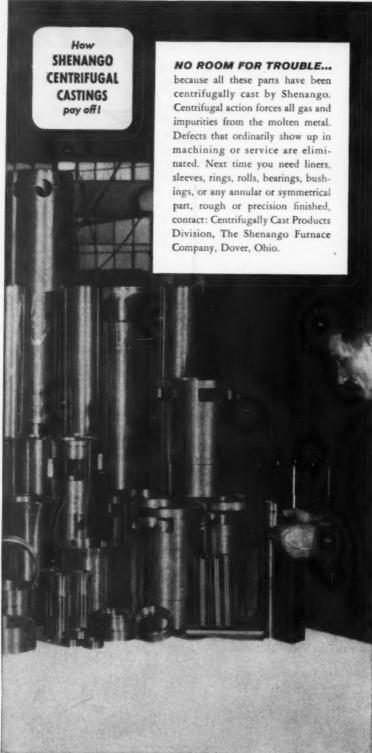
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Mueller Brass Co., Port Huron 35, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

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Cleveland Punch & Shear Works Co., 3917 St.
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(Continued on page 336)



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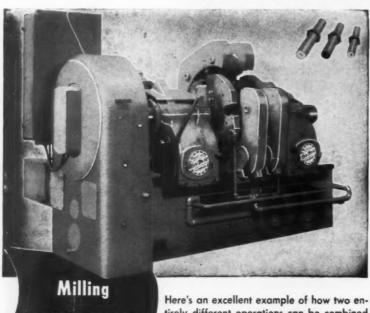
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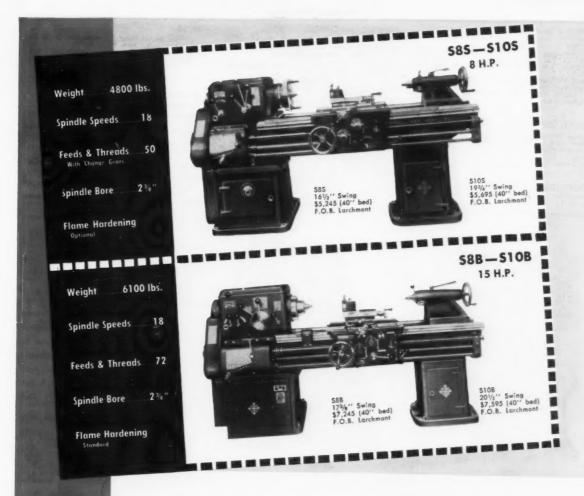
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Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
Heller Tool Co., Heller Dr., Newcomerstown Ohio Mitts & Merrill, 1809 S. Water St., Saginaw

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DoAII Co., Des Plaines, III.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gleason Works, 1000 University Ave., Rochester, N. Y. Gleason V ter, N. Hone Corp., 8100 Schoolcraft, De-Micromatic troit 4, Mich. Norton Co., 1 New Bond St., Worcester 6, Mass.
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Delta Power Tool Div., Rockwell Mfg. Co.,
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Gisholt Machine Co., 1245 E. Washington Ave.,
Madison 10, Wis.
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
Jones & Lamson Mch., 512 Clinton St., Springfield, Vt. K., Mch. Tool Co., Madison and
Edwards Rds., Cincinnati 18, Ohio
Lodge & Shipley Co. 3055 Colerain Ave., Cincinnati 25, Ohio
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio
Sheldon Mch. Co., Inc., 4258 N. Knox Ave.,
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Atlas Press Co., Kalamazoo, Mich.
Cosa Corp., 405 Lexington Avs., New York
17, N. Y.
Hardinge Bros., Inc., 1420 College Avs., Elmira, N. Y.
Homestrand, Inc., Larchmont, N. Y.
LeBlend R. K., Mch. Tool Co., Madison and
Edwards Rds., Cincinnati 18, Ohio
Levin, Louis & Son, Los Angeles 21, Calif.
Sheldon Mch. Co., Inc., 426–4258 N. Knox
Avs., Chicago 41, III.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.

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Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio Bullard Co., Bridgeport 6, Conn. Consolidated Mch. Tool Div., Blossom Read, Rochester 10, N. Y.

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LATHES, Crankshaft

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Wickes Brothers, 512 No. Water \$t., Saginaw, Mich.

LATHES, Double-End

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Lodge & Shipley Co., 3055 Colerain Ave., Cincinsot 25, Ohio

Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio

Sidney Machine Tool Co., Sidney, Ohio

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American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Chio
Atlas Press Co., Kalamazzo, Mich.
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Angeles Så, Calif.
Barber-Colman Co. (Hendey Mch. Div.), Rockford, Ill.

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Consolidated Mch., Tool Div., Blossom Road,
Rochester 10, N. Y.,
Cosa Corp., 405 Lexington Ave., New York
17, N. Y.
Pelta Power Tool Div., Rockwell Mfg. Co.,
Pittsburgh, Pa. Eustocchio, S., Brescia, Italy.
Homestrand, Inc., Larchmont, N. Y.
Hydra-Feed Mch. Tool Corp., 730 W. Eight
Mile Rd., Ferndale 20, Mich.
LeBlond, R. K. Mch. Tool Co., Madison and
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Loage & Shipiey Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Monarch Machine Tool Co., 27 Oak St., Sidney, Chicline Tool Co., 2401 Central Parkway, Cincinnati 25, Ohio
Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox
Ave., Chicago 41, Ill.
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Springfield Mch. Tool Co., Springfield, Ohio
Western Machine Tool Works, Holland, Mich.
Wickes Brothers, S12 No. Water St., Soginaw,
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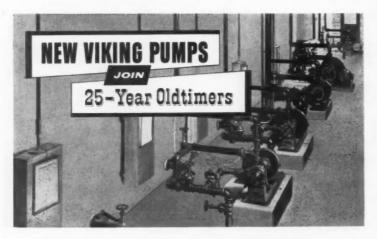
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Div., Hamilton, Ohio
LeBlond, R. K., Mch. Tool Co., Madison and
Edwards Rds., Cincinnati 18, Ohio
Lodge & Shipley Co. 3055 Colerain Ave., Cincinnati 25, Ohio
South Bend Lathe Works Inc., 425 E. Madison 3t., South Bend, Ind.

LATHES, Roll

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Baldwin-Lima-Hamilton Corp., Lima Hamilton
Div., Hamilton, Ohio
Bliss, E. W., Co., Canton, Ohio
LeBlond, R. K., Mch. Tool Co., Madison and
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Monarch Mch. Tool Co. Oak, St., Sidney, Ohio

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(Continued on page 350) (Continued on page \$50)



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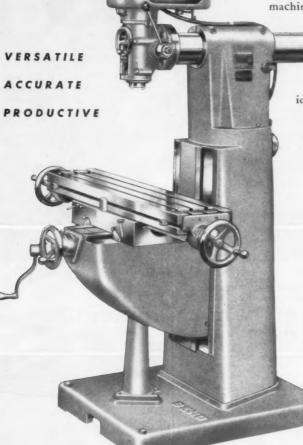
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Jones & Lamson Mch. Co., 512 Clinton St.,
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Nat'l Acme Co., 170 E. 131st St., Cleveland
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New Britain Mch. Co., New Britain-Gridles
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Bullard Co., Brewster St., Bridgeport 2, Conn
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Delta Power Tool Div., Rockwell Mfg. Co.
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Madison 10, Wis.
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Levin & Son, Inc., Louis, Los Angeles 8, Calif.
New Britain Mch. Co., New Britain-Gridley Div.,
New Britain, Conn.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
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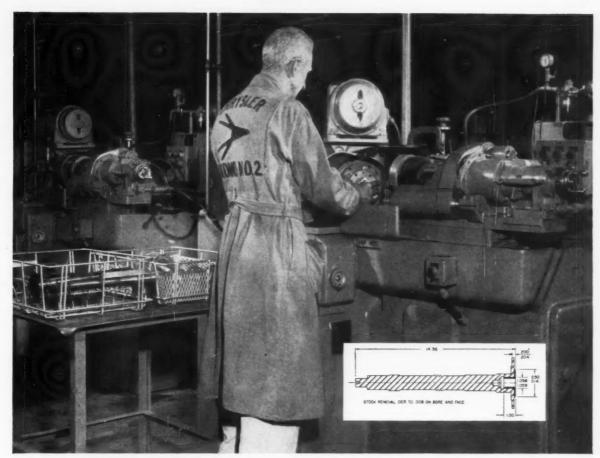




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350-MACHINERY, April, 1957



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Tool Co., Fond du Lac, Wis.
Gorton, George, Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Greaves Mch. Tool Div. 2011 Eastern Ave.,
Cincinnati 2, Ohio
Hardinge Bross, Inc., 1420 College Ave., El
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Homestrand, Inc., Larchmont, N. Y.
Kearney & Trecker Corp. Milwaukee, Wis.
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Van Norman Co., 3640 Main St., Springfield
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Cross Co., 3250 Bellevue Ave., Detroit 7, Mich
Ingersoll Milling Mch. Co., 2442 Douglas St.,
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Jones & Lamson Mch. Co., 160 Clinton St.,
Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis.
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Pratt & Whitney Co., Inc., West Hartford.
Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette.
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Sundstrand Mch. Tool Co., 2531 11th St.,
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Simplex, Duplex

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Consolidated Mch. Tool Div., Blossom Road,
Rochester 10, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard
Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Morris, Robert E. Co., 76 Mamaroneck Ave.,
White Plains, N. Y.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Sundstrand
Mch. Tool Co., 2531 11th St.,
Rockford, Ill.
S. Tool Co., Inc., 255 North 18th St.,
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Van Norman Co., 3640 Main St., Springfield
7, Mass.

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Ingersoll Milling Mch. Co., 2442 Douglas St.,
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Kearney & Tracker Corp., Milwaukee, Wis.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
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G & L and Hypro Div., Giddings & Lewis Mcn.
Tool Co., Fond du Lac, Wis.
Gorton, George, Machine Co., 1110 W. 13th
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Kearney & Trecker Corp., Milwaukee, Wis.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
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Sundstrand Mch. Tool Co., 2531 - 11th St.,
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Austin Industrial Carp., 76 Mamaroneck Ave., White Plains, N. Y.

Axelson Mg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.

Frown & Sharpe Mfg. Co., Providence, R. I.

Bullard Co., Bridgeport 6, Conn.

Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio Cosa Corp., 405 Lexington Ave., New York 17, N. Y.

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Homestrand, Inc., Larchmont, N. Y.

Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.

Kearney & Trecker Corp., Milwoukee, Wis.

Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.

Van Norman Co., 3640 Main St., Springfield 7, Mass.

.

MILLING MACHINES, Knee Type Rise and Fall

end Fell
Cincinnati Milling & Grinding Mches., Inc.,
4701 Marburg Ave., Cincinnati 9, Ohio
Cosa Corp., 405 Lexington Ave., New York
17, N. Y.
Homestrand, Inc., Larchmont, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave.,
White Plains, N. Y.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

MILLING MACHINES, Knee Type Ram Agron Mochinery Co., Inc., 45 Crosby St., New York 12, N. Y., Co., 235 Premenade St., Providence 1, R., Co., 235 Premenade St., Gorton Mch. Co., 1321 Racine St., Racine, Wia. Wis.
Kearney & Trecker Corp., Milwaukee, Wis.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Knee Type,

Agron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. Gorton Mch. Co., 1321 Racine St., Racine, Wis.

MILLING MACHINES, Knee Type, Vertical

Vertical

Aron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.

Atlas Press Co., Kalamazoo, Mich.
Austin Industrial Corp., 76 Mamaroneck Ave.,
White Plains, N. 160 S. Boyle Ave., Los Angeles 38, Calif.
Bridgeport Mches., Inc., 500 Lindley St.,
Bridgeport & Corn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinanti Milling & Grinding Mches., Inc.,
4701 Marburg Ave., Cincinnati 9, Ohio
Cosa Corp., 450 Lexington Ave., New York
17, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Homestrand, Inc., Larchmont, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Orbon, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Russell, Holbrook & Henderson, Inc., 292
Madison Ave., New York 17, N. Y.
South Bend Lathe Wks., South Bend 22, Ind.

MILLING MACHINES, Planer Type

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio (Continued on page 354)



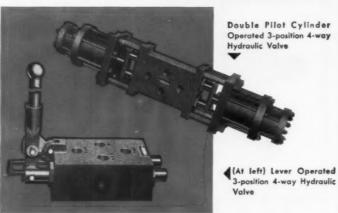
The basic Model "150" Hydrohoner is a new, standardized and economical Microhoning machine . . . priced for manufacturers with limited capital or relatively short production runs.

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Hand and Pilot-operated Types for water or hydraulic oils to 5000 psi.

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Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
G & L and Hypro Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio Ingersoil Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee. Wis.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersy City 2, N. J.
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.

MILLING MACHINES, Spar

Boldwin-Line-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio G & L and Hypro Div., Giddings & Lewis Mch. Tool Co., Fond du Loc, Wis. Kearney & Trecker Corp., Milwaukee, Wis. Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.

MILLING MACHINES, Thread

Coulter Mch. Co., James, Bridgeport 5, Conn. Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn. Lees-Bradner Co., The, Cleveland 11, Ohio

MOLDING MACHINES, Plastic

Baker Bros., Inc., 1000 Post St., Toledo 10, Baker Bros., Inc., 1000 Post St., Toledo 10, Ohio
Elmes Eng. Div., Paddock Rd. & Tennessee Ave., Cincinnati, Ohio
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio Lake Erie Engra. Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Watson-Stillman Co., Roselle, N. J.

MOTORS, Electric

MUIORS, Electric
Allis-Chalmers Mfg. Co. Milwaukee, Wis.
Delta Power Tool Div., Rockwell Mfg. Co.
Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Howell Electric Motors Co., Howell, Mich.
Lincoln Electric Co., Cleveland 17, Ohio
Reliance Electric & Engrg. Co., 1074 Ivanhoe
Rd., Cleveland 10, Ohio

MOTORS, Hydraulic

Barnes, J. S. Corp., Rockford, III. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Hydraulic Press Mfg. Div., Mt. Gilead, Ohio Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis. Wis. Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill. Vickers, Inc., Detroit 32, Mich.

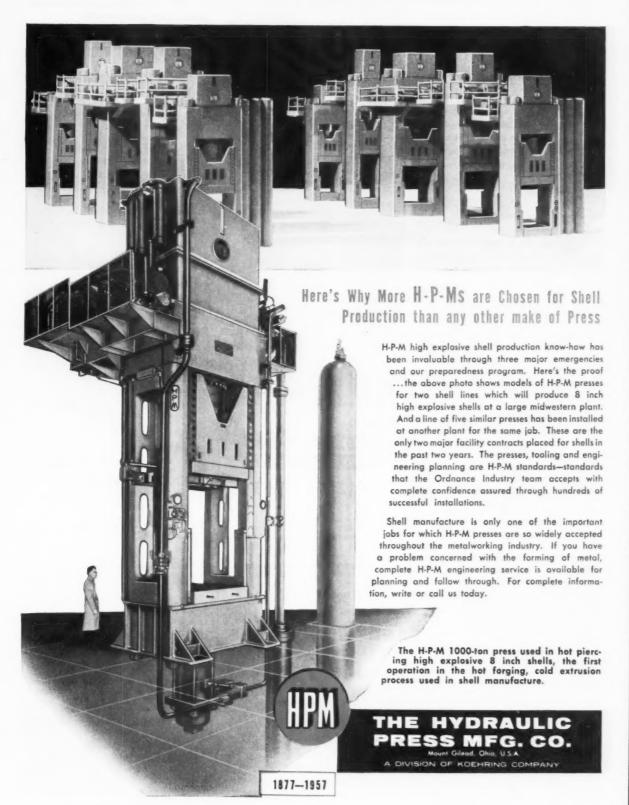
MULTIPLE INSPECTION GAGES-See Gages, Multiple Inspection

MULTIPLE-STATION MACHINES, Diel

Avey Drilling Mch. Co., 25 E. 3rd St., Covington, Ky. Baker Bros., Inc., 1000 Post St., Toledo 10, Ohio Barnes Drill Co., 814 Chestnut St., Rockford, Baush Mch. Tool Co., 15 Wason Ave., Spring-Boush Mcn. 1001 Co., 15 Wason Ave., Spring-field, Mass. Cross Co., 3250 Bellevue, Detroit 7, Mich. Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y. Federal Prod. Corp., 1144 Eddy St., Providence 1, R. I. 1, R. I.
Greenlee Bros. & Co., 2136 - 12th St., Rockford, III.
Hartford Special Machinery Co., 287 Homestead St., Hartford, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
La Salle Tool, Inc., 3840 E. Outer Drive,
Detroit 34, Mich.

(Continued on page 356)

IT'S A MATTER OF EXPERIENCE . . .



For more information fill in page number on Inquiry Card, on page 255

MACHINERY, April, 1957-355

Millholland, W. K., Mchry. Co., Inc., Indian-apolis 20, Ind. Modern Industrial Engrg. Co., 14230 Birwood Ave., Detroit 38, Mich. National Automatic Tool Co., S. 7th N. Sts., National Automatic 1901 Ca., 3, 711 Ct. Scr., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette Ave., Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.

Millholland, W. K., Mchry. Co., Inc., Indianapolis 20, Ind. apolis 20, Ind.

Modern Industrial Engrg. Co., 14230 Birwood
Ave., Detroit 38, Mich.

Moline Tool Co., 102-20th St., Moline, Ill.

National Automatic Tool Co., S. 7th N. Sts.,
Richmond, Ind.

Norton Co., 1 New Bond St., Worcester 6,
Mass.

Snyder Tool & Engrg. Co., 3400 E. Lafayette
Ave., Detroit 7, Mich.

Sundstrand Mch. Tool Co., 2531 - 11th St.,
Rockford, Ill.

Verson Allsteel Press Co., 9399 S. Kenwood
Ave., Chicago 19, Ill.

NIBBLING MACHINES

Thor Power Tool Co., 175 N. State St., Aurora, Wales-Strippet Corp., North Tonawanda, N. Y.

NICKEL AND NICKEL ALLOYS Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Square, Pittsburgh 22, Pa.

NUT SETTERS-See Screwdrivers, etc.

NUTS-See Bolt, Nuts and Screws

OIL EXTRACTORS De Laval Separator Co., Poughkeepsie, N. Y.

MULTIPLE-STATION MACHINES, Transfer Type

Avey Drilling Mch. Co., 25 E. 3rd St., Covington, Ky. Baker Bros., Inc., 1000 Post St., Toledo 10, Ohlo Barnes Drill Co., 814 Chestnut St., Rockford, Baush Mch. Tool Co., 15 Wason Ave., Springfield, Mass. Buhr Mch. Tool Co., 839 Green St., Ann Arbor, Mich.
Bullard Co., Bridgeport 6, Conn.
Cincinnati Milling Mch. Co., Cincinnati 9,

Ohio Clearing Mch. Corp., 6499 W. 65th St., Chicago 38, III. Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Greenfield Bros. & Co., 2136 - 12th St., Rackford III. Greenfield Bros. & Co., 2136 - 12th St., Rack-ford, III. Hartford Special Machinery Co., 287 Home-stead St., Hartford, Conn. Heald Machine Co., 10 New Bond St., Worces-ter 6, Mass. Kearney & Trecker Corp., Milwaukee, Wis. La Salle Tool, Inc., 3840 E. Outer Drive, De-troit 34, Mich.

OIL GROOVERS Wicaco Machine Corp., Wayne Junction, Phil-adelphia, Pa.

OILERS AND LUBRICATORS

Gits Bros. Mfg. Co., 1858 S. Kilbourn Ave., Chicago, III. Madison-Kipp Corp., Madison, Wis. Wicaco Mch. Corp., Philadelphia, Pa.

OILS, CUTTING SOLUBLE—See Cutting and Grinding Fluids

OILS, Lubricating-See Lubricating Oils and Greases

OILS, Quenching and Tempering Cities Service Oil Co., 70 Pine St., New York, N. Y.

Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.

Shell Oil Co., 50 W. 50th St., New York, N. Y.

Sinclair Refining Co., 600 - 5th Ave., New York, N. Y.

Standard Oil Co., (Indiana), 910 S. Michigan Ave., Chicago 80, III.

Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa.

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OPTICAL FLATS

Crone Packing Co., 1800 Cuyler Ave., Chicago, III.
DoAll Co., Des Plaines, III.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12 N. Y.
Van Keuren Co., Watertown 72, Mass.

PACKING, Leather, Metal, Rubber, Asbestos, Etc.

Crane Packing Co., 1800 Cuyler Ave., Chicago, Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa. Watson-Stillman Co., Roselle, N. J.

PAINTING EQUIPMENT, Spray-See Spraying Equipment, Metal

PARALLELS

Brown & Sharpe Mfg. Co., Providence, R. I. DoAll Co., Des Plaines, III.
G & L and Hypro Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Lufkin Rule Co., Saginaw, Mich.
Starrett, The L. S., Co., Athol, Mass.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal Mummert-Dixon Co., Hanover, Pa.

PIPE, Steel, Stainless, etc.

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Babcock & Wilcox Co. (Tubular Prod. Div.), Beaver Falls, Penna. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., 105 W. Bern St., Read-

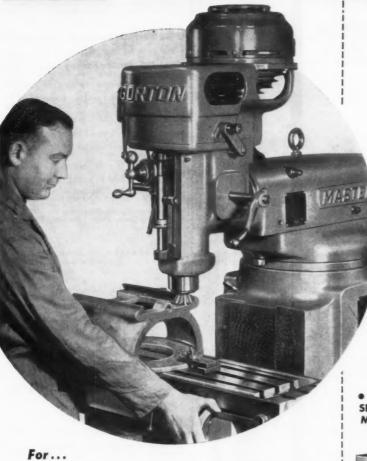
PIPE AND TUBING MILLS, Electric-weld Yoder Co., 5504 Walworth Ave., Cleveland 2,

PIPE AND TUBING, Brass and Copper American Brass Co., 25 Broadway, New York, N. Y.
Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.
Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y.

(Continued on page 358)



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- PRECISION SPINDLE: 10 SPEEDS. 80-5600 R.P.M. STANDARD
- DESIGNED AND BUILT TO PRO-VIDE SUSTAINED ACCURACY
- LONGITUDINAL FEED, 22 INCHES
- SADDLE LENGTH, 24 INCHES
- CROSS FEED, 101/2 INCHES
- VERTICAL FEED OF KNEE, 151/4 INCHES
- SPINDLE FEED, 4 INCHES

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CHUCKS



PREMIUM CHUCK PERFORMANCE

AT NO PREMIUM IN PRICE!

These benefits	for these reasons	result from these PREMIUM features
LONGER TOOL LIFE	Breakage reduced	7 New four-slot design increases resistance to pull-out approximately four times.
	Drills and taps	 Greater number of slots permits chuck to close eventy on all sides and along shook of tool.
GREATER ACCURACY	run true	3, Bore and shank are concentric within .002", gaged at distance equal to projection of standard jobber-length drill from the chuck.
	Accuracy of chuck lasts longer	#, Hardened alloy steel gives you best combination of spring callet action, high torsional strength, and sustained high ac- curacy.
INCREASED PRODUCTION	Downtime reduced	5. Improved seating and spring collet action of four-slot design facilitates easy tool changes.
		6. Four-way gripping action gives you greater protection against drill and top breakage.



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"Precision Holding" for holding precision

Scully-Jones and Company, 1906 South Rockwell Street, Chicago S, Illinois



PIPE THREADING AND CUTTING MACHINES

Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis. Landis Machine Co., Inc., Waynesboro, Pa. Sheffield Corp., Dayton I, Ohio

PLANER JACKS-See Set-up Equipment

PLANERS, Double Housing and Openside

Openside

Baldwin-Lima-Hamilton Corp., Lima Hamilton
Div., Hamilton, Ohio

Consolidated Mch. Tool Div., Rochester, N. Y.
G & L and Hypro Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., 3611 Woodburn Ave., Cincinnati, Ohio

Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

Rockford Machine Tool Co., 2500 Kishwaukee
St., Rockford, III.

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Dow Chemical Co., Midland, Mich. Eastman Kodak Co., 343 State St., Rochester 4, N. Y.
Gisholt Mch. Co., Madison, Wis.
U. S. Steel Corp., Nat'l Tube Div., Pittsburgh. Pa.

PRESS BRAKES-See Brakes, Presses and Bending

PRESS FEEDERS, Automatic

Bliss Co., E. W., Canton, Ohio Federal Press Co., 511 Division St., Elkhart, Ind. Ind.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Producto Machine Co., 985 Housatonic Ave.,
Bridgeport 1, Conn.
U. S. Tool Co., East Orange, N. J.

PRESS STACKERS and STORAGE SHUTTLES

Michigan Production Eng. Co., Hazel Park, Mich.

PRESSES, Arbor

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
du Mont Corp., Greenfield, Mass.
Hannifin Corp., 510 S. Wolf Rd., Des Plaines,
III.
Logansport Machine Co., Inc., Logansport, Ind.
Threadwell Tap & Die Corp., 16 Arch St.,
Greenfield, Mass.
Watson-Stillman Co., Roselle, N. J.
Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Assembling

PRESSED, Assembling
Bliss, E. W. Co., 1375 Raff Rd. S. W., Canton,
Ohio
Colonial Broach & Machine Co., Box 37, Detroit 13, Mich.
Detroit Broach Co., Inc., 950 S. Rochester Rd.,
Rochester, Mich.
Erie Foundry Co., 1253 W. 12th St., Erie 6,
Pederal Press Co., 511 Division St. Elibert Federal Press Co., 511 Division St., Elkhart, Ferracute Machine Co., Bridgeton, N. J. Hannifin Corp., 510 S. Wolf Rd., Des Plaines, III. Hydraulic Press Mfg. Co., Mount Gilead, Ohio Lake Erie Engineering Corp., 470 Woodward Ave., Buffalo, N. Y.

PRESSES, Blanking, Stamping

Baird Machine Co., 1700 Stratford Ave., Strat-ford, Conn. Bath, Cyril Co., 32324 Solon Rd., Solon, Ohio Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Bliss, E. W. Co., 1375 Raff Rd. S. W., Canton,
Ohio Chambersburg Engineering Co., Chambersburg, Pa. Pa.
Clearing Machine Corp., 6499 W. 65th St., Chicogo 38, III.
Cleveland Crane & Engineering Co., Wickliffe,
Ohio
Cleveland Punch & Shear Wks. Co., 3917 St.
Clair Ave., Cleveland 14, Ohio
Danly Machine Specialties, Inc., 2100 S.
Laramie, Chicago 50, III. Federal Machine & Welder Co., 1745 Overland Ave. N. E., Warren, Ohio Federal Press Co., 511 Division St., Elkhart Ind.

Ave. N. E., Warren, Charles, Ave. N. E., Warren, Charles, Co., 511 Division St., Elkhart, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., Mount Gileod, Ohic
Johnson Machine & Press Corp., 620 W
Indiana Ave., Elkhart, Ind.
L. B. Teress Corp., 1631 Sterling Ave., Elkhart, Ind.
Loke Erie Engineering Corp., 470 Woodward
Ave., Buffalo 17, N. Y.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Minster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland
Ave., Buffalo 11, N. Y.
U. S. Tool Co., Inc., 255 N. 18th St., East
Orange, N. J.
Verson Allsteel Press Co., 9309 S. Kenwood
Ave., Chicago 19, Ill.
Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Briquetting

Birdsboro Steel Foundry & Machine Co., Birds-boro, Pa. Hydraulic Press Mfg. Co., Mount Gilead, Ohic Lake Erie Engineering Corp. 470 Woodward Ave., Buffalo 17, N. Y. Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Closed-Die Forging

Ajax Manufacturing Co., 1441 Chardon Rd. Cleveland 17, Ohio
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Bliss, E. W. Co., 1375 Raff Rd. S. W., Canton Ohio Chambersburg Engineering Co., Chambersburg Pa. Pa. Clearing Machine Corp., 6499 W. 65th St., Chicago 38, III. Erie Foundry Co., 1253 W. 12th St., Erie 6, Pa.

Hydraulic Press Mfg. Co., Mount Gilead, Ohio Lake Erie Engineering Corp. 470 Woodward Ave., Buffalo 17, N. Y.

Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, III.

Wilson, K. R., Arcade, N. Y.

PRESSES, Coining, Embossing

Birdsboro Steel Foundry & Machine Co., Birds-boro, Pa. Biss, E. W. Co., 1375 Raff Rd., S. W., Canton Ohio Chambersburg Engineering Co., Chambersburg Ohio Chambersburg Engineering Co., Chambersburg Pa.
Pa. Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Punch & Shear Wks. Co., 3917 St.
Clair Ave., Cleveland 14, Ohio
Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.
Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Johnson Machine & Press Corp. 620 W. Indiana
Ave., Elkhart, Ind.
Lake Erie Engineering Corp., 470 Woodward Johnson Machine & Press Corp. 620 W. Indiana Ave., Elikhart, Ind.
Lake Erie Engineering Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Minster Machine Co., Minster, Ohio
Niogara Machine & Tool Wis., 637 Northland Ave., Buffalo 11, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, III.
Wilson, K. R., Arcade, N. Y.

PRESSES, Die Sinking (Hobbing)

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio ton, Ohio Chambersburg Engineering Co., Chambersburg Pa.
Clearing Machine Corp., 6499 W. 65th St.
Chicago 38, III.
Erie Foundry Co., 1253 W. 12th St., Erie 6, Pa
Hydraulic Press Mfg. Co. Mount Gilead, Ohic
Lake Erie Engineering Corp., 470 Woodward
Ave., Buffalo 17, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood
Ave., Chicago 19, III.
Wilson, K. R., Inc., Arcade, N. Y.

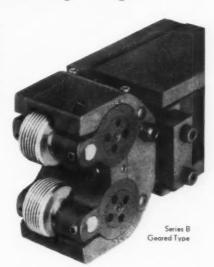


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Provide Full Diameter Range To Maximum Capacity

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- Adapters for more than 300 crossslide applications
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- Simple precision matching with prematched rolls
- Dovetail clamping arrangement simplifies setup by permitting head to be removed from adapter
- · Self-compensating roll action



FOUR STANDARD SIZES

Model No.	Complete Digmeter Range	⁹ Pipe Threads That May Be Rolled	Approximate Number of Common Screw Threads That May Be Rolled
B 10	0-5/8"	7	80
B 13	1/8"-13/16"	9	90
B 18	1/4"-11/8"	15	105
B 36	3/8"-21/4"	18	185

*Straight and Taper Pipe Threads, including Dryseal (NPTF). Change may be made from Straight to Taper Threading by changing rolls only. No other equipment is necessary. ATTACHMENTS DESIGNED FOR SPECIAL APPLICATIONS

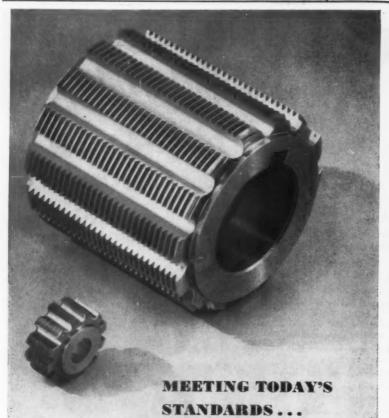
Attachments and Rolls for Straight Thread and Taper Pipe Thread In Stock—FOR IMMEDIATE DELIVERY

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TAPS: THREAD GAGES: HOBS: CENTERING MACHINES: THREAD MILLING MACHINES AND CUTTERS

PRESSES, Die Tryout

PRESSES, Die Tryout

Bliss, E. W. Co., 1375 Raff Rd., S. W., Conton, Ohio
Clearing Machine Corp., 6499 W. 65th St.,
Chicago 38, III.
Cleveland Punch & Shear Wks. Co., 3917 St.
Clair Ave., Cleveland 14, Ohio
Frie Foundry Co., 1253 W. 12th St., Erie 6, Pa.
Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio
Federal Press Co., 511 Division St., Elikhart, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Honnifin Corp., 510 S. Wolf Rd., Des Plaines,
III. Hannitin Corp., 510 S. Wolf Rd., Des Profiles
III.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Johnson Machine & Press Corp., 620 W. Indiana Ave., Elkhart, Ind.
L & J Press Corp., 1631 Sterling Ave., Elkhart,
Ind.
Loke Erie Engineering Corp., 470 Woodward
Ave., Buffalo 17, N. Y.
Ainster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland
Ave., Buffalo 11, N. Y.
Products Machine Co., 985 Housatonic Ave.,
Bridgeport 1, Conn.
Verson Allsteel Press Co., 9309 S. Kenwood
Ave., Chicago 19, III.
Wilson, K. R., Inc., Arcade, N. Y.

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I

PRESSES, Drawing

PRESSES, Drawing
Balrd Machine Co., 1700 Stratford Ave., Stratford Conn.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Bliss, É. W. Co., 1375 Raff Rd., S. W., Canton, Ohio
Cincinnati Milling & Grinding Machines, Inc., 4701 Marburg Ave., Cincinnati 9, Ohio
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, III.
Cleveland Crane & Engineering Co., Wickliffe, Ohio
Cleveland Punch & Shear Wks. Co., 3917 St. Ohio
Cleveland Punch & Shear Wks. Co., 3917 St.
Clair Ave., Cleveland 14, Ohio
Danly Machine Specialties, Inc., 2100 S. Laramle, Chicago 50, Ill.
Erie Foundry Co., 1253 W. 12th St., Erie 6, Pa.
Federal Machine & Welder Co. 1745 Overland
Ave., N. E., Warren, Ohio
Ferracurte Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Johnson Machine & Press Corp., 620 W. Indiana Ave., Elkhart, Ind.
L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind. L & J Press Corp., 1631 Sterling Ave., EIKRIGIT, Ind.
Lake Erie Engineering Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Minster Machine Co., Minster, Ohlo
Niagara Machine & Tool Wks., 637 Northland
Ave., Buffalo 11, N. Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Verson Allsteel Press Co., 9309 S. Kenwood
Ave., Chicago 19, III.
Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Extrusion

PRESSES, Extrusion
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohlo
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.
Elmes Eng. Div., Paddock Rd. & Tennessee Ave., Cincinnati, Ohlo
Pederal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohlo
Hydraulic Press Mgf. Co., Mount Gilead, Ohlo
Lake Erie Engineering Carp., 470 Woodward Ave., Buffalo 17, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Watson-Stillman Co., Roselle, N. J.
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Hvdraulic Press Mfg. Co., Mount Gilead, Ohio
Niagara Machine & Tool Wks., 637 Northland
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Products Machine Co., 985 Housatonic Ave.,
Bridgeport 1, Conn.
Verson Allsteel Press Co., 9309 S. Kenwood
Ave., Chicago 19, Ill.
Wilson, K. R., Arcade, N. Y.

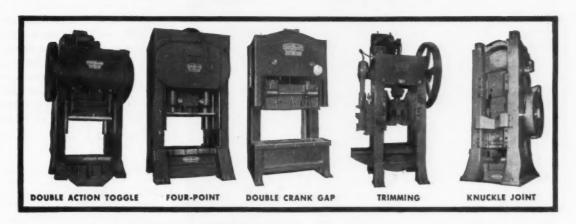
PRESSES, Horning

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(Continued on page 362)

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Lake Erie Engineering Corp., 470 Woodward
Ave., Buffalo 17, N. Y.
Minster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland
Ave., Buffalo 11, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood
Ave., Chicago 19, III.

PRESSES, Notching

PRESSES, Notching
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Chicago 38, III.
Federal Machine & Welder Co., 1745 Overland
Ave., N. E., Warren, Ohio
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engineering Corp., 470 Woodward
Ave., Buffalo 17, N. Y.
Minster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland
Ave., Buffalo 11, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood
Ave., Chicago 19, III.
Wales-Strippet Co., 345 Payne Ave., N. Tonawanda, N. Y.
Wilson, K. R., Inc., Arcade, N. Y.

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L & J Press Corp., 1631 Sterling Ave., Elkhart. Ind.
Lake Erie Engineering Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Minster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
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Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
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Wilson, K. R., Inc., Arcade, N. Y.

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(Continued on page 364)



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Hannifin Corp., 510 S. Wolf Rd., Des Plaines,
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Lake Erie Engineering Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Minster Machine Co., Minster, Ohio Niagara Machine & Tool Wis., 637 Northland Ave., Buffalo 11, N. Y.
Verson Altsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, III.
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Hydraulic Press Mfg. Div., Mount Gllead, Ohio
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Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.

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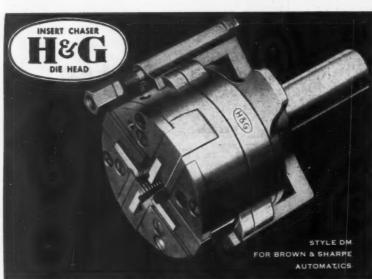
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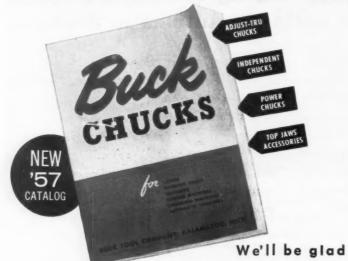
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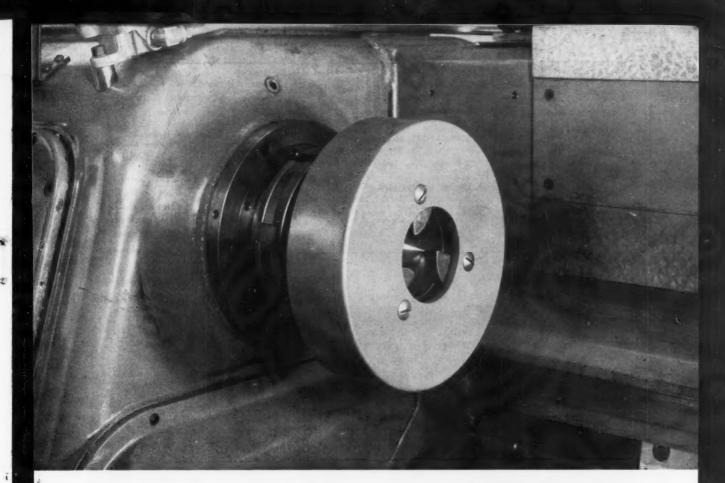
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(Continued on Page 368)



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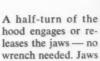
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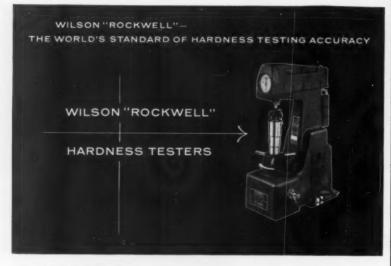
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(Continued on Page 370)



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When Gisholt Machine Company, Madison, Wisconsin, designed its new Masterline Saddle Type Turret Lathe, it gave clutch selection the same careful attention it gave the rest of the machine. In the final analysis, two Twin Disc MTS Clutches were chosen for use in the machine's new headstock gear train.

2

This is typical in machine tool design, for Twin Disc MTS and MTU Clutches (single and duplex) offer such advantages as:

- Designed specifically for machine tools... with compactness a prime consideration.
- High torque and rpm capacity . . . with operating mechanism unaffected by centrifugal force.

- Single-point plate adjustment.
- Oil-type units, for rapid cycle operation . . . dry-type for less frequent actuation . . . in sizes from 3" to 9".
- Built-in quality and workmanship

 with heat-treated operating parts for maximum durability.

Twin Disc MTS and MTU Clutches are designed for unusually long life, easy operation and minimum maintenance. Whether you're a designer, manufacturer or user of machine tools, you'll want these sturdy, trouble-free clutches designed into your next machine . . . for the many benefits they have to offer.

Arrow points to one of the MTS Clutches in the lathe's headstock gear train. Close-up of MTS Clutch shown below.



TWIN DISC CLUTCH COMPANY, Racine, Wisconsin . HYDRAULIC DIVISION, Rockford, Illinois

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370-MACHINERY, April, 1957

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Ill
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Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
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National Twist Drill & Tool Co., Rochester, Mich.

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Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.

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(Continued on Page 372)



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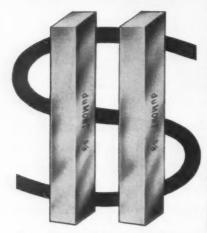


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MACHINERY, April, 1957-371

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TAP HOLDERS

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E-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

National Automatic Tool Co., S. 7th - N Sts., Richmond, Ind.

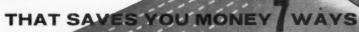
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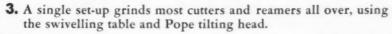
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Western Machine Tool Works, Holland, Mich. Zagar Inc., 24000 Lokeland Blvd., Cleveland 23, Ohio

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Sheffleld Corp., 721 Springfield St., Dayton 1, Ohio

THREAD ROLLING DIES-See Dies, Thread Rolling

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THREAD ROLLING EQUIPMENT

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Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill. (Turret)
Vascoloy-Ramet Corp., North Chicago, Ill.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffolo 7, N. Y.

TOOL MATERIAL, Cast Non-Ferrous

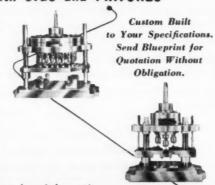
Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong
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Haynes Stellite Co., 725 So. Lindsay St.,
Kokomo, Ind.
Lovejoy Tool Co., Inc., Springfield, Vt.
Vascoloy-Ramet Corp., North Chicago, Ill.

TOOL MATERIAL, Cemented Carbide

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Do more . . . and do it better with Errington Fixed Center Drilling Heads. They drill any number of varied size holes on different elevations. The head has grooved thrust ball bearings at all thrust points and hardened bronze radial bearings. Heat treated spindles and gears, of one piece turned from solid bar stock. It is geared approximately 2:1. All enclosed in a sand-cast aluminum case and cover, with alemite pressure lubrication.



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374-MACHINERY, April, 1957



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TOOL MATERIAL, Ceremic

Metal Carbides Corp., Youngstown 12, Ohio Norton Co., 1 New Bond St., Worcester 6,

TOOL MATERIAL, High-Speed Steel

TOOL MATERIAL, High-Speed Steel
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Apex Tool & Cutter Co., Inc., 235 Canal St.,
Shelton, Conn.
Armstrong Bros. Tool Co., 5213 W. Armstrong
Ave., Chicago 30, Ili.
Carpenter Steel Co., Reading, Pa
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland 14, Ohio
Crucible Steel Co. of America, Oliver Bldg.,
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du Mont Carp., 289 Wells St., Greenfield, Mass.
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National Tube Div., U. S. Steel Corp., 525 Wm.
Penn Place, Pittsburgh, Pa.
Revere Copper & Brass, Inc., 230 Park Ave.,
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Ryerson, Jos. T. & Son, 2559 W. 16th St.,
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376—MACHINERY, April, 1957



Tongue support part for New Holland baler, prepared with 75-ton Warco inclinable punch press, is shown fitted in place on Hayliner 68 assembly line at New Holland, Pa. Inspecting the job is Sub-assembly Foreman Lee. Larkin.

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MACHINERY, April, 1957-377

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Logansport Machine, Inc., 810 Center Ave.,
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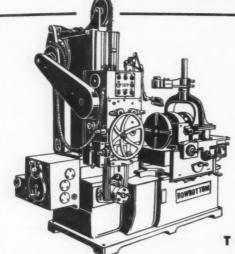
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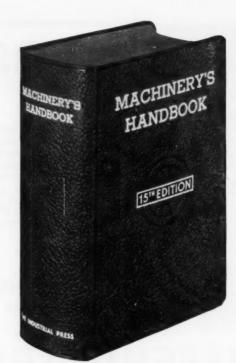
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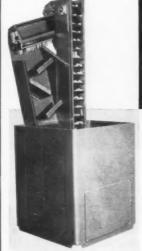
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MACHINERY, April, 1957-381



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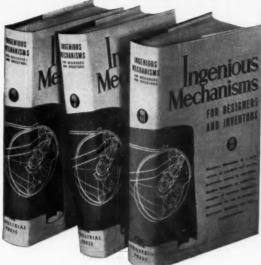
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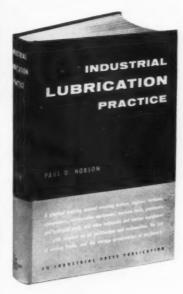


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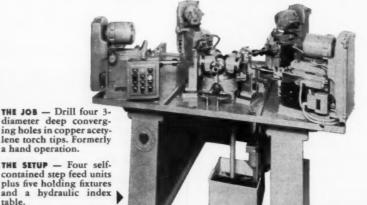
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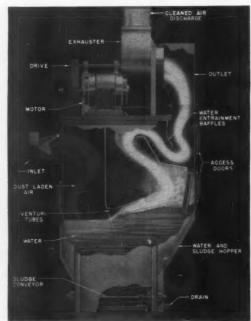
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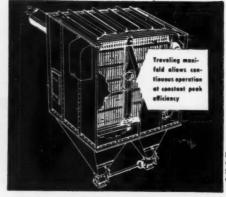
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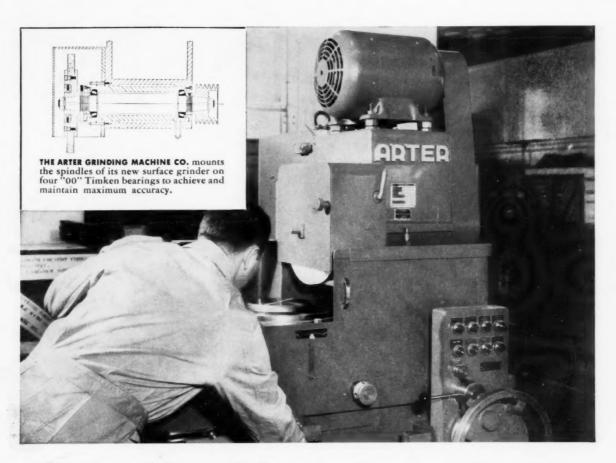
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